

U.S. Department of Transportation
Docket Management Facility West Building Ground Floor Room W12-140
1200 New Jersey Avenue, S.E.
Washington, D.C. 20590

Dear Sir or Madam:

Pursuant to Section 333 of the FAA Modernization and Reform Act of 2012 (the Reform Act) and 14 C.F.R. Part 11, Aerial Intelligence HD, LLC ("AIHD, LLC"), hereby applies for an exemption from the listed Federal Aviation Regulations ("FARs"). Aerial Intelligence HD, LLC ("Petitioner") hereby applies for an exemption in order to conduct commercial use operations with unmanned aerial systems ("UAS"). In accordance with the requirements of the Federal Aviation Administration ("FAA"), Petitioner's UAS operations have been designed to achieve a level of safety equivalent to that provided by the FAA regulations from which an exemption is requested.

Attached please find Petitioner's request for an exemption from the listed Federal Aviation Regulations to allow commercial operation of its small Unmanned Aircraft Systems ("sUAS") for aerial imaging for agricultural analysis and rural farm safety and monitoring of secured and controlled environmental areas. The sUAS will be flown exclusively in Class G airspace for this purpose. This exemption request is also exclusively for the use of the UAS manufactured by Turbo Ace, Inc. – model Turbo Ace Cinewing 6 HL.

Attached to this letter is the Turbo Ace, Inc. UAS Flight Manual ("Manual"), which outlines the operating requirements, limitations, and technical specifications for the Turbo Ace system. Owner/Operator of AIHD, LLC is a licensed, degreed (BSME) Professional Mechanical Engineer and has reviewed this Manual and found it to be acceptable for sUAS operations on its secure project sites.

Thank you for your time and consideration.
Sincerely,



Thomas Hotard, P.E.
Owner/Operator
Aerial Intelligence HD, LLC
19257 252nd Ave
Bettendorf, IA 52722

Cc: John S. Duncan
Director, Flight Standards Service

Congressman: Dave Loebsack

Proposed Commercial Uses

Petitioner proposes to use the Turbo Ace Cinewing 6 HL small UAS aircraft for multiple commercial applications, including safety inspections and aerial surveying of the following remote or difficult-to-access facilities:

- Rural farms with low population density;
- Silos/stacks;
- Grain elevators;
- Pipelines;
- Power lines and cell towers;
- Bridges;
- Wind turbines.

Petitioner also may use UAS operations in support of emergency response activities on behalf of The Department of Agriculture, The Department of the Interior's Bureau of Safety and Environmental Enforcement, and any other federal or state government agency which may require its services and personnel. All of Petitioner's proposed UAS operations are intended to facilitate safety inspections and aerial surveying in areas where the performance of those functions using current methods involves considerable expense and/or a substantial risk of injury. Many of these functions must be performed in hazardous environments by human interaction. Others may be performed much more efficiently with an unmanned aircraft with the ability to hover and capture images at close range. The commercial UAS applications that Petitioner proposes will therefore result in a significant enhancement of safety, by reducing the risks associated with current inspection methods and enhancing current inspection techniques.

Proposed UAS Aircraft

Petitioner plans to conduct commercial UAS operations with the Turbo Ace Cinewing 6 HL aircraft. The Turbo Ace Cinewing 6 HL is a small UAS with a maximum takeoff weight of 20.6 lbs. At all times, while conducting commercial operations, Petitioner will operate the Turbo Ace Cinewing 6 HL under line-of-sight conditions with a hands-on control and in response to commands from a Petitioner employee with specialized flight training. Aircraft will perform commercial operations autonomously or in accordance with a pre-programmed flight plan. If the motors on the aircraft experience a power loss within 20% of empty, the Turbo Ace Cinewing 6 HL has an audible and tactile alarm and failsafe home return system. In the event that the signal between the control system and the Turbo Ace Cinewing 6 HL is lost or disrupted, the aircraft is designed to hover for approximately 5 seconds attempting to regain the data link. If the UAS, which is equipped with a GPS communication system, is unable to re-establish contact with the control station, it will rely on an auto-pilot feature that returns the UAS to the home point via the original flight path from the launch point. This will eliminate "fly-away" incidents and other flight deviations that are known to occur with other types of UAS aircraft.

The Turbo Ace Cinewing 6 HL using a NAZA M V2 control has been used for commercial cinematography and survey work due to both platforms being stable and simple to operate. The NAZA M control system has substantial commercial operating duty cycles inside the U.S. and is known for being rugged with a history of reliability in flight.

Operating Conditions

Petitioner will conduct commercial operations with the Turbo Ace Cinewing 6 HL only in accordance with a highly-detailed set of safeguards governing all phases of flight operations. Petitioner employees responsible for UAS operations will always place a priority upon minimizing risk to personnel, equipment, assets and the environment. To ensure the highest level of safety, UAS flight operations will only be conducted after an extensive safety briefing (including Petitioner and customer personnel) and a risk analysis has been conducted. A majority of Petitioner's operations will be in sparsely populated rural agricultural areas that pose no risk of injuries to humans.

All UAS flights operated by Petitioner will be conducted by a minimum of two operational personnel, including a system supervisor. No flights may be initiated unless a preflight checklist has been completed and signed by all those Petitioner employees performing the checks. The checklist procedure includes a detailed inspection of the Turbo Ace Cinewing 6 HL prior to the initiation of any operations. Attached as Exhibit A to this exemption petition, is a copy of Aerial Intelligence HD, LLC's pre-flight and post-flight checklist. Any UAS operations to be conducted at an altitude of more than ten feet require the prior approval of Petitioner supervisory personnel. Most importantly, from a safety perspective, operations directly overhead Petitioner and customer personnel are not permitted as the UAS aircraft must be operated at all times at no more than a 30 degree oblique to any personnel.

There are several additional mandates that Petitioner employees will observe in connection with all commercial operations with the Turbo Ace Cinewing 6 HL, including the following:

- No flights through an established Air Defense Identification Zone (ADIZ);
- UAS flights shall not exceed 400 feet above ground or above the sea level per FAA Advisory Circular 91-57;
- All flights will be conducted in Class G airspace;
- All flights will be conducted within line-of-sight of UAS operator;
- All flights will be conducted in accordance with Class G airspace visibility requirements;
- Wind speed shall not exceed 25 knots;
- UAS operations will be conducted during daylight hours;
- A Notice to Airmen (NOTAM) will be filed with the FAA prior to each UAS operation;

At no point in time will Aerial Intelligence, HD's UAS aircraft be allowed to share airspace with commercial aircraft. Prior to conducting operations within three miles from any airport runway, Petitioner will notify the airport operator or the airport tower, as the case may be, in compliance with FAA Advisory Circular 91-57. Petitioner employees will terminate any UAS operations when an approaching commercial aircraft is within five nautical miles.

Operator Requirements

Aerial Intelligence HD, LLC's commercial UAS operations will build on its years of experience as a Licensed, Professional Mechanical Engineer. Only Petitioner employees who have undergone and successfully completed a rigorous competency assessment evaluation will be selected to operate the Turbo Ace Cinewing 6 HL. Operators must demonstrate not only a superior knowledge of the technical issues associated with UAS systems, including the full range of the capabilities and limitations of the Turbo Ace Cinewing 6 HL aircraft, but also must show sound piloting techniques and the ability to navigate around structures. Petitioner employees conducting UAS commercial operations will enforce compliance more stringently than written and not accept that "compliance means safe".

The Petitioner operators of the Turbo Ace Cinewing 6 HL have previous significant experience as the operators of the equipment. Any operator of the Turbo Ace Cinewing 6 HL will undergo a program of simulator training as well as hands-on flight training in a simulated inspection environment. Simulator training will allow these employees to gain experience with the specific flight characteristics of the Turbo Ace Cinewing 6 HL prior to any actual commercial operations.

The following requirements will apply to any commercial UAS operations conducted by Petitioner:

- A pilot-in-command (PIC) will be designated at all times for each flight;
- The PIC will be directly responsible for, and have final authority over the operation of the UAS;
- The PIC will not perform concurrent duties as the visual observer;
- The PIC will be qualified on the Turbo Ace Cinewing 6 HL;
- The PIC will exercise control over the UAS as it will not maneuver autonomously.

Given technical education, training and personal and professional safety record, the amount of required training, and the operational procedures applicable to Petitioner operating the Turbo Ace Cinewing 6 HL for commercial purposes, Petitioner PIC's should not be required to hold an FAA pilot certificate. The commercial UAS operations by Petitioner will resemble the circumstances under which the FAA will issue a Certificate of Waiver or Authorization to UAS operators without requiring pilot certification. All operations will be in Class G airspace, conducted during daylight hours under visual line-of-sight flight procedures no more than one-half nautical mile laterally from the Petitioner PIC.

The manager for Aerial Intelligence HD, LLC's commercial UAS operations is Thomas Hotard, P.E. Mr. Hotard is a degreed Mechanical Engineer (BSME) has over thirty years of experience designing, testing, and operating microprocessor-controlled industrial equipment and components.

Exemption Request Summary

Petitioner is requesting an exemption from FAA regulations in order to conduct commercial UAS operations with a Turbo Ace Cinewing 6 HL. Attached below is a list of each FAA regulation from which the Petitioner is requesting an exemption and the justification for each such exemption. In accordance with FAA requirements, in the case of each requested exemption, Petitioner is suggesting alternate methods of compliance that will provide a level of safety equivalent to that provided by the regulation from which an exemption is sought.

Petitioner's request is consistent with the FAA's policies for the granting of exemptions. It also is in accordance with the direction provided by Congress in Section 333 of the FAA Modernization and Reform Act of 2012 ("FAA Modernization Act"), instructing the Secretary of Transportation to determine which UAS aircraft operating within visual line of sight may be integrated into the National Airspace System NAS before the development of regulations governing the commercial use of other types of UAS aircraft. Because of the relatively small size, light weight, speed and operational capabilities of the Turbo Ace Cinewing 6 HL, as well as the strict visual line of sight protocols under which these UAS will be operated by Petitioner, the Turbo Ace Cinewing 6 HL aircraft may be safely operated without creating a hazard to other users of the NAS or a threat to national security. The Turbo Ace Cinewing 6 HL, operated as proposed herein, is therefore the type of UAS that ought to be the subject of operational approval by the Department of Transportation prior to the issuance of regulations governing the operation of small, unmanned aircraft systems generally.

The UAS operations to be conducted by Petitioner pursuant to the requested exemption offer significant safety enhancements over current methods of providing the same commercial services. Turbo Ace Cinewing 6 HL aircraft have the ability to fly into difficult-to-access areas that present substantial hazards to other methods of data collection, including those involving close-up inspections by human beings. In evaluating Petitioner's request for an exemption, the FAA should consider not just the ability of Petitioner to achieve a level of safety equivalent to that afforded by the regulations from which an exemption is sought, but also the safety benefits to be derived from using UAS aircraft for services now performed by other means at substantially greater risk to human life. As demonstrated below, the FAA can allow these benefits to be realized without compromising its obligation to promote the highest level of aviation safety.

Respectfully submitted,

Thomas Hotard, P.E.
Owner/Operator
Aerial Intelligence, HD LLC

AERIAL INTELLIGENCE HD, LLC- ITEMIZED EXEMPTION REQUESTS

Aerial Intelligence HD, LLC requests an exemption from the following regulations of the Federal Aviation Administration:

14 C.F.R. § 45.23(b)- Display of marks; general

This regulation requires the display of an "N" registration mark on any U.S.-registered aircraft. Additional markings are required for limited or restricted category aircraft, experimental aircraft or provisionally-certificated aircraft on the entrance to the cabin, cockpit or pilot station.

Referencing Exemption 11109 **Regulatory Docket No. FAA-2014-0507**, In the matter of the petition of **CLAYCO, INC.**

Regarding the petitioner's requested relief from 14 CFR 45.23(b) *Display of marks*, the petitioner requests this relief under the assumption that marking with the word "experimental" will be required as a condition of a grant of exemption. However, this marking is reserved for aircraft that are issued experimental certificates under 14 CFR 21.191. The petitioner's UAS will not be certificated under § 21.191, and therefore the "experimental" marking is not required. Since the petitioner's UAS will not be certificated under § 21.191, a grant of exemption for § 45.23(b) is not necessary.

Equivalent level of safety analysis: The surface area of the Turbo Ace Cinewing 6 HL is not large enough to contain any of the markings required by the FAA for limited or restricted category aircraft, experimental aircraft or provisionally-certificated aircraft. One of the purposes served by these markings is to caution passengers onboard such an aircraft (including any pilot) that it does not meet all of the FAA's requirements for a standard category certificate of airworthiness. As the Turbo Ace Cinewing 6 HL will not carry any passengers, and otherwise will operate in accordance with strictly-controlled flight parameters, the absence of such a warning on the Turbo Ace Cinewing 6 HL will not result in any reduction in the overall safety of the operation.

Petitioner is willing to include any markings that may be required by the FAA in connection with its commercial UAS operations, with the understanding that the surface area of the Turbo Ace Cinewing 6 HL will not permit lettering that is larger than one inch in height. In addition, if requested by the FAA, Petitioner can place markings on each of the control stations used to operate Petitioner's UAS aircraft.

14 C.F.R. Part 21, Subpart H: Airworthiness Certificates

14 C.F.R. § 91.203: Civil Aircraft: Certifications Required

Under 14 C.F.R. § 91.203, all U.S.-registered aircraft are required to have a certificate of airworthiness issued by the FAA. Part 21, Subpart H of the FAA's regulations establishes the procedural requirements for the issuance of airworthiness certificates by the FAA.

Referencing Exemption 11109 **Regulatory Docket No. FAA-2014-0507**, In the matter of the petition of **CLAYCO, INC.**

The petitioner requested relief from 14 CFR part 21, Certification procedures for products and parts. In accordance with the statutory criteria provided in Section 333 of P.L. 112-95 in reference to 49 USC § 44704, and in consideration of the size, weight, speed, and limited operating area associated with the aircraft and its operation, the Secretary of Transportation has determined that this aircraft meets the conditions of Section 333.

Therefore, the FAA finds that the requested relief from 14 CFR part 21, and any associated noise certification and testing requirements of part 36, is not necessary.

Equivalent level of safety analysis: The strict operational limitations under which Petitioner will conduct flights for commercial UAS applications (e.g., daylight operations, use of Class G airspace, all flights within line-of-sight of the operator) are at least as restrictive as the limitations that apply to the operation of limited or restricted category, experimental or provisionally-certificated aircraft. The Turbo Ace Cinewing 6 HL does not carry a pilot or any other passengers and their small size and electric motor reduce the danger that any collisions with the ground or structures will involve anything more than the loss of the sUAS.

14 C.F.R. § 61.133(a): Commercial Pilot Privileges and limitations

FAA regulations generally require that an aircraft may engage in operations for compensation or hire only if it is flown by a person holding a commercial pilot certificate. 14 C.F.R. § 61.133(a). Petitioner submits that hands-on experience with the flight characteristics of the Turbo Ace Cinewing 6 HL and UAS aircraft generally are a far more effective guarantee of flight safety than a pilot certificate would be in connection with Aerial Intelligence HD, LLC's proposed commercial UAS services.

Equivalent level of safety analysis. A UAS, such as the Turbo Ace Cinewing 6 HL has flight characteristics substantially different from manned aircraft. The propulsion system and control surfaces on the Turbo Ace Cinewing 6 HL respond to inputs that are transmitted remotely from the joy stick located on the control station. A pilot license of any kind would not be useful in the actual operation of the sUAS. An operator who had done all his training on the Turbo Ace Cinewing 6 HL, with no previous flight experience with manned aircraft, would have no preconceived notions or training to ignore and would be intimately familiar with maneuvering the Turbo Ace Cinewing 6 HL.

Aerial Intelligence HD, LLC employee/operator will act as an operator of Turbo Ace Cinewing 6 HL 6 HL commercially after successfully completing a minimum of 20 hours of UAS training flights. The above-listed hours will be recorded in logbooks subject to inspection by FAA personnel at any time.

By requiring extensive flight experience with the Turbo Ace Cinewing 6 HL prior to conducting commercial operations, Petitioner will have a better grasp of the handling of that aircraft and the available options in the event of an emergency than they would by holding a commercial pilot certificate for an entirely different type of airborne system.

14 C.F.R. § 91.7(a): Civil Aircraft Airworthiness.

This regulation prohibits the operation of an aircraft unless it is in an airworthy condition. The Turbo Ace Cinewing 6 HL 6 HL will not be the subject of an airworthiness certification process prior to their use by 01 for commercial UAS services.

Referencing Exemption 11109 **Regulatory Docket No. FAA-2014-0507**, In the matter of the petition of **CLAYCO, INC.**

Regarding the petitioner's requested relief from 14 CFR 91.7(a) *Civil aircraft airworthiness*, Clayco's request is based on its belief that "no FAA regulatory standard will exist for determining airworthiness," of the

Skycatch UAS. It claims an equivalent level of safety will be provided, "given the size of the aircraft and the requirements contained in the Manual for maintenance and use of safety checklists prior to each flight, as set forth in the Section B and Section G." While the UAS will not require an airworthiness certificate in accordance with 14 CFR part 21, Subpart H, the FAA considers the petitioner's compliance with its Flight Manual (hereinafter referred to as the operator's manual) to be sufficient means for determining an airworthy condition in accordance with § 91.7(a). Therefore, relief from § 91.7(a) is granted. The petitioner is still required to ensure that its aircraft is in an airworthy condition – based on compliance with manuals and checklists identified above – prior to every flight.

Equivalent level of safety analysis. As there will be no airworthiness certificate issued for the aircraft, should this exemption be granted, no FAA regulatory standard will exist for determining airworthiness. Given the size of the aircraft and the requirements contained in the Operator's Manual for maintenance and use of safety check lists prior to each flight, an equivalent level of safety will be provided during operation of the sUAS

14 C.F.R. § 91.9(b)(2): Civil Aircraft Flight Manual, Marking and Placard Requirements.

This regulation requires that an approved flight manual, manual material, markings, placards or some combination thereof be placed onboard the aircraft. The Turbo Ace Cinewing 6 HL has a configuration suitable for compliance with this requirement.

Referencing Exemption 11109 **Regulatory Docket No. FAA-2014-0507**, In the matter of the petition of **CLAYCO, INC.**

The petitioner requested relief from 14 CFR 91.9(b)(2) *Civil aircraft flight manual, marking, and placard requirements* and 14 CFR 91.203(a) and (b) *Civil aircraft: Certifications required*. Based on the FAA Memorandum "Interpretation regarding whether certain required documents may be kept at an UA's control station," dated August 8, 2014, the requested relief from §§ 91.9(b)(2) and 91.203(a) and (b) is not necessary.

14 C.F.R. § 91.109(a) and 14 C.F.R. § 91.109(c): Flight Instruction: Simulated Instrument Flight and Certain Flight Tests.

Under this regulation, aircraft used for training purposes must have dual flight controls, subject to certain exceptions. FAA regulations also require that whenever training is provided in a simulator, the simulator must have a second control seat occupied by a safety pilot who possesses at least a private pilot certificate with category and class ratings appropriate to the aircraft being flown.

Equivalent level of safety analysis. Petitioner has flight instruction training program for its employees who will conduct commercial UAS operations. Pilots will be required to perform frequent training flights and refresher flights in a sterile environment with suitable objects for pilots to navigate to and around in a simulated commercial environment.

The requirement for dual flight controls on an aircraft used for training purposes is mitigated by the Turbo Ace Cinewing 6 HL's limited operational range, small dimensions and the use of lightweight construction materials, all of which reduce the risk of damage to surrounding structures in the event of an operator error that results in the loss of the aircraft.

14 C.F.R. 91.119: Minimum Safe Altitudes: General

This regulation specifies the minimum altitude in various flight environments below which aircraft are not allowed to operate. Petitioner will conduct the commercial services it proposes to operate below the FAA-specified minimum of 400 feet AGL and closer to vessels and structures than the minimum separation of 400 feet mandated by the FAA.

Equivalent level of safety analysis. The operation of the Turbo Ace Cinewing 6 HL aircraft exclusively in Class G airspace (i.e., below 400 feet) is intended as a safety measure to provide a level of separation between Aerial Intelligence HD's commercial UAS operations and the operation of manned aircraft at altitudes above 400 feet. Limiting the Turbo Ace Cinewing 6 HL to flights below the 400-foot AGL will enhance safety rather than compromise it. The risk of damage to any nearby structures or facilities is reduced by Turbo Ace Cinewing 6 HL's limited operational range, small dimensions and the use of lightweight materials in their construction. Petitioner requests narrowing separation from fixed structures to 100 feet in order to properly inspect said structure.

14 C.F.R. § 91.121: Altimeter Settings

Pursuant to this regulation, an aircraft that is operating below 18,000 feet above Mean Sea Level must contain an altimeter that is set to one of several designated altimeter settings prior to departure. The Turbo Ace Cinewing 6 HL for use in the Petitioner's operation includes provisions for an altimeter. This telemetry will be provided if deemed necessary.

Equivalent level of safety analysis: The operation of the Turbo Ace Cinewing 6 HL sUAS exclusively in Class G airspace (i.e., below 400 feet) away from commercial traffic and ATC-controlled airspace reduces the need for an altimeter onboard Petitioner's UAS aircraft. The altitude of Petitioner's UAS aircraft above Mean Sea Level and its GPS coordinates will be displayed on the screen of the remote control station used by the operator to perform any commercial services. The operator will have continuous situational awareness of the UAS altitude and position as flight operations will be conducted under line-of-sight flight procedures.

14 C.F.R. § 91.151(a): Fuel Requirements for Flight in VFR Conditions.

FAA regulations require that a rotorcraft operating under VFR conditions have sufficient fuel to fly to the first point of intended landing and, assuming normal cruising speed, to fly for at least an additional 30 minutes. Turbo Ace Cinewing 6 HL has a maximum operating time of 30 minutes.

Equivalent level of safety analysis. The FAA's regulations require sufficient reserves of additional fuel to enable a rotorcraft to find the nearest suitable landing zone if the intended landing facility is not available. The additional time that a multirotor is required to be able to operate is less than the time required to allow fixed-wing aircraft to find a suitable landing field (30 minutes during the day). Petitioner will perform commercial operations autonomously or in accordance with a pre-programmed flight plan. If the motors on the aircraft experience a power loss within 20% of empty, the

Turbo Ace Cinewing 6 HL has an audible and tactile alarm and failsafe home return system to ensure that the sUAS will have ample power and time required for a safe landing from the original open take-off area.

14 C.F.R. § 91.203(a) & (b): Civil Aircraft: Certifications Required.

The FAA requires that all civil aircraft have an appropriate and current airworthiness certificate and that the airworthiness certificate or special flight authorization for an aircraft be displayed at the cabin or cockpit entrance so that it is visible to passengers or crew. The Turbo Ace Cinewing 6 HL does not have a current airworthiness certificate nor do they have a surface area large enough to display a certificate of airworthiness or special flight authorization.

Equivalent level of safety analysis. The strict operational limitations under which Petitioner will conduct flights for commercial UAS applications (e.g., daylight operations, use of Class G airspace, all flights within line- of-sight of the operator) are at least as restrictive as the limitations that apply to the operation of aircraft that have been issued limited or restricted category, experimental or provisional certificates of airworthiness.

14 C.F.R. § 91.405(a); 407(a)(1); 409(a)(2); 417(a): Aircraft Maintenance and Inspections; Maintenance Records.

FAA regulations impose various requirements regarding the maintenance of civil aircraft, including periodic inspections, approval for return to service by a qualified mechanic following maintenance or repair, an airworthiness inspection and certain rules concerning maintenance recordkeeping. Petitioner's maintenance of its Turbo Ace Cinewing 6 HL will not satisfy these requirements.

Equivalent level of safety analysis. Petitioner will maintain the Turbo Ace Cinewing 6 HL in accordance with the manuals and operating handbook provided by the manufacturer. Because of the Turbo Ace Cinewing 6 HL's small size and lightweight construction, Petitioner will be able to subject it to top-to-bottom examination after every flight. All pre- or post-flight maintenance, equipment failures, charge cycle logs, fault/repair logs, inspections and general maintenance records will be kept on file for a minimum of three years. Petitioner has developed a lengthy pre/post-flight checklist; any sUAS which is unable to meet all the requirements for safe operation will be removed from service immediately and will not return to service until any defects have been remedied

If any parts have been updated by the manufacturer, Petitioner agrees to immediately place them on the sUAS if its purpose is to ensure its UAS has the most recent equipment and software to provide for public safety.

The number of hours that a sUAS has been in operation is logged by Petitioner to ensure proper life of components as well as the flight packs that provide power.

Turbo Ace CINEWING 6

Hexacopter User Manual

V28



Turbo Ace CINEWING 6

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INTRODUCTION

1.1 Welcome to the World of Hexacopters

A NEW ERA IN SUPER SIZED HEXACOPTERS

With twice the payload of a standard sized octocopter, the CINEWING 6 Hexacopter is designed to effortlessly carry large DSLR cameras such as the Canon 5D Mark iii or the Nikon D800. While most foldable systems cause structural problems or require disassembly or hardware removal, the fully assembled CINEWING 6 can easily fold into a portable footprint or lock into position for flight. There is even an industrial grade travel-friendly aluminum case designed to transport and safeguard your investment.

Hexacopters are loosely classified into several categories - from toys for amusement to complex units for professional video, science & research. Now, a new class of Hexacopter is emerging for commercial applications. The Turbo Ace CINEWING 6 is the clear leader in this group with a list of outstanding features: an advanced PC interface (so you can update or customize the flight controller), cutting edge auto-stabilizing mode for videographers, anti-vibration mounts, dynamically balanced motors for high definition video production, and a host of other upgrades to improve reliability. Unlike most Hexacopters, CINEWING 6 is fully assembled and tested in the USA and it is ready to produce high quality video right out of the box. CINEWING 6 parts, upgrades and accessories are fully supported online and locally in the USA. If you are starting from scratch, the CINEWING 6 RTF package even includes a paired transmitter that is fully programmed and calibrated. For additional flight training, you can choose from our optional Phoenix flight simulator, an easy-to-fly helicopter, and/or a mini Walkera QR X350 quad.

1.2 Important Instructions

- Follow the instruction manual for a **tied down flight test on a bench**. This is the safest way to make sure the CINEWING 6 Hexacopter has not been damaged during shipping.

Turbo Ace CINEWING 6

- Foldable CINEWING 6 aluminum arms operate on guiding carbon tracks with keyed circular locks on each end. To release the arm from the folded or operating ends of the track, **please unscrew the arm bolt counter-clockwise to a height of 1/8” before the lock will release.** If the bolt is not unscrewed to a sufficient height, you may risk scratching the carbon track. Make sure the red arrow with a circle on top of the GPS antenna is pointing to the front of the CINEWING 6. If the CINEWING 6 flies in a toilet bowl pattern, the arrow direction can be adjusted slightly to compensate by turning it within a 10 degrees radius from the forward direction. Any over-adjustment of this arrow pointer will cause the Hexacopter to lose control.
- Prior to each takeoff, make sure the GPS antenna/compass is erected from the folded position and screwed down.
- When mounting a propeller, use loctite and make sure the propeller clamp sits flat against the top of the propeller. Even new propellers may need to be balanced if vibration shows on video. Use a blade balancer with heavy gauge tape adhered to the underside of the blade for balance. In bright sunlight, the GoPro 3 may show rolling shutter jello. Use an ND8 filter if necessary to slow down its shutter speed.
- Battery must be positioned by moving it backward and forward until the front and back weights are balanced from the center point of the Naza flight controller. You can lift the CINEWING 6 up with a finger on each side to check the balance (see manual for details). The battery can be placed either on top or bottom of the CINEWING 6.
- Camera must be balanced like a seesaw on a brushless gimbal, otherwise the gimbal motors will be stressed and vibrate.

Maintaining the CINEWING 6's LiPo Batteries

- CINEWING 6 batteries are made up of 6 cells, and each cell must be maintained between 3.7V to 4.2V. The total voltage for CINEWING 6 batteries should be maintained between 22.2V (3.7Vx6) and 25.2V (4.2Vx6) without load.

VERY IMPORTANT: Keep each cell above 3.7V. A cell is at risk of being damaged or life shortened at 3.67V per cell without load.

- Each CINEWING 6 battery includes a yellow charging/discharging plug and a white balancing plug. Both plugs must be plugged in to charge the battery. The yellow plug with thicker gauge wires enables a faster charge rate, while the white plug with 1 small red wire and 6 small black wires enables the

Turbo Ace CINEWING 6

charger to balance charge 6 individual cells. When all 6 cells reach approximately 4.2V each for a total of 25.2V, the charger will automatically stop.

- **A battery meter is one of the best tools for monitoring voltage for any LiPo battery.** There are seven pins on the battery meter. One of the pins is marked with a “-” symbol, which should line up with the black wire of the battery’s white balancing plug. The first number displayed is the total voltage of the battery, followed by the voltage of each individual cell.

Before & After Each Flight

- Attitude mode is the most reliable way to fly for experienced pilots, as it is not susceptible to GPS interference. GPS mode is commonly used by beginners, but once more experience is acquired, attitude mode is highly recommended (you can still use GPS mode as a backup). When orientation is lost, do not panic. Just flip to GPS mode and let go of the cyclic stick, and the GPS will take over. Do not attempt to recover the craft with the cyclic stick. There is a certain time of the year in which solar flare may interfere with GPS. To recover the craft in such a case, switch to manual (not attitude) mode. Please be aware that if the CINEWING 6 has passed through airport X-ray screening, near a magnet or has been relocated more than 30 miles from where it was originally calibrated, the GPS may need to be recalibrated depending on the geographic latitude at which you are located (see manual).
- Before each flight, always turn on the transmitter first, then plug in the CINEWING 6 battery. Then, you need to allow enough time for the flight controller and GPS to warm up and initialize. The Naza Lite takes approximately 2 minutes to warm up. The yellow LED light will turn off when the Naza Lite is ready for use.
- **IMPORTANT: After each flight, always unplug the CINEWING 6 battery first, then turn off the transmitter.** If you forget, the Hexacopter and/or transmitter will continue to drain power and the battery will be damaged.

Dos

- Do initialize the CINEWING 6 & takeoff from a large, leveled surface.
- Do implement a pre-flight checklist & use it consistently before takeoff.
- Do unplug the CINEWING 6 battery when maintaining or upgrading the Hexacopter.
- Do dismount propellers if battery is plugged in while updating the flight controller.

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Don'ts

- Don't operate near people or pets & do not allow people to approach an operating Hexacopter.
- Don't use magnetized screwdrivers & tools in close proximity to the GPS antenna.
- Don't attempt to catch a Hexacopter.

PRE-FLIGHT CHECKLIST & IMPORTANT SAFETY OPERATION

- Check for any loose screws and power wires on the CINEWING 6 and camera gimbal.
- Check for cracked or loose blades. Make sure that loctite is applied to all propeller locking nuts.
- For quality video, camera gimbal must be firmly secured by screws. Shake it gently to check that all screws and sliding bearings are tightly secured.
- Ensure that the model on your transmitter matches with the CINEWING 6 you are flying.
- Make sure the battery is 24.6V or higher before plugging it into the CINEWING 6.
- Make sure all switches on top of the transmitter panel are flipped forward (away from you). Top-side switches (i.e. flight mode switch) should be flipped down.
- (Optional for Dual Operator Setup only) Bind the camera gimbal receiver to the camera transmitter first. Ensure that the camera is on record mode and the transmitter and receivers are both turned on. Test video reception by waving your hand in front of the camera.
- Remember to set the focus on the camera. Most wide-angle lenses should be set to close to infinity.
- Bind the CINEWING 6 to the pilot transmitter. Set the transmitter menu so that the voltage of the copter is shown on the LCD (only available when telemetry option is installed). Wait for the CINEWING 6's yellow flashing LED light to change color.

This usually takes about 2 minutes. Next, wait for the continuous flashing green/purple light, which indicates the copter is locked into more than 6 satellites (you are still able to fly if you are locked into less than 6 satellites).

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- **IMPORTANT:** The flashing RED light is the low voltage warning, so land the CINEWING 6 within one minute. When the CINEWING 6 is in the second stage of power protection, it will land itself and attempt to auto-level while doing so.

In the Case of an Emergency

LOSS OF ORIENTATION: Do not panic- if the CINEWING 6 has already attained the minimum 30 ft range from home position, it has already established its orientation. Do not attempt to recover the craft with the cyclic stick. Flip the GPS mode switch on the top left side of the transmitter all the way forward to GPS mode. Simply let go of the cyclic stick on your transmitter, and GPS will take over and automatically level the craft.

- After landing, unplug the CINEWING 6 battery and gimbal battery, and power off all devices such as the pilot transmitter, camera transmitter, video transmitter, and video receiver.

1.3 Quick Start

The CINEWING 6 has a convenient foldable arm design. When you first remove it from the box, please make sure that the GPS antenna is erected and properly tightened by turning the top locking cylinder in a clock-wise direction. Next, loosen the arm screws located on top of the folding track. These screws are keyed so they must be loosened and raised by about 1/8 of an inch in order for the arms to fold. Unfold the arms and tighten them back in a clock-wise manner. Make sure the round key located on the bottom of the screw is securely locked into the circular key on the track. When it is properly locked in, it will prevent the arms from accidentally folding during flight. Refer to section 5 TESTING & OPERATIONS (Please DO NOT install the propellers during the testing procedure). Attach the battery to either the top or bottom of the CINEWING 6. Lift the CINEWING 6 up with one finger on each side from the center of flight controller. Move the battery until the CINEWING 6 is leveled like a seesaw with equal weight on both sides. It is important to note that the CINEWING 6 will not fly properly and may lose control and crash if the center of gravity is not balanced at the middle of the flight controller. Turn on the transmitter, and within 2 seconds, plug in the CINEWING 6 battery to bind. If your unit comes with DJI NAZA, please observe the blinking yellow LED light located behind the quad, which indicates the controller is in warm up stage. Wait for about 2 minutes until the yellow

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light stops flashing. Please check the LED light description at section 5.3. GPS remains to be the easiest and the safest way to fly for beginners. However, Attitude mode is the most reliable way to fly for intermediate to advanced level pilots, as all GPS setups are susceptible to interference and sun spots activities. If you are a trained pilot and use the GPS mode as a backup, select the attitude mode from your transmitter. Move both sticks of the transmitter together, in one action, down to the lower right or left corner to start the motors. Release right stick and immediately give the left stick about 10% throttle so the motors will not cease. It will not lift off until the throttle stick passes 50%. Have an experienced pilot test fly it on a bench while tied down. No defective claim is allowed if the unit is crashed, so please be very careful.

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Video Instruction Link

Please make sure to remove all propellers before setting up your CINEWING 6.

The following instructions are required for ARF package setup (without transmitter).

If you purchased the RTF package (including transmitter), you can skip this section.

How to set fail safe with Spektrum radio for CINEWING 6:

<https://www.dropbox.com/s/j6sj8y6ro7lawrw/4.%20How%20to%20Set%20Fail%20Safe%20with%20Spektrum%20transmitter.MP4>

How to set up your transmitter calibration for CINEWING 6:

<https://www.dropbox.com/s/oty0tdrhui7twj/5.%20How%20to%20setup%20transmitter%20calibration.MP4>

How to set up your autopilot and voltage settings for CINEWING 6:

<https://www.dropbox.com/s/bqf163uevm0g2g7/6.%20How%20to%20setup%20autopilot%20setting.MP4>

How to setup folding arm for CINEWING 6:

Video coming

How to install camera mount for CINEWING 6:

<https://www.dropbox.com/s/o6d4xiqnn529brv/3.%20How%20to%20install%20camera%20mount.MP4>

How to check motor direction:

Video coming

How to install crown nut for the motor:

Video coming

1.4 Features

- Advanced Multi-Counter-Rotating Rotor System designed for outstanding stability & performance
- Intelligent Programmable DJI Naza or DJI WooKong-M
- Built-in Altitude Hold when throttle stick is released

Turbo Ace CINEWING 6

- Flight Controller with PC software interface
- Triple Flight Mode: GPS Attitude Mode & Attitude Mode & Manual Mode
- Advanced Gyro with 6-DOF Motion & MEMS Sensor Technology
- Independent Core offers full compatibility with standard 2.4GHz systems
- 6 Dynamically Balanced Brushless Motors with outstanding power and minimal vibration
- 6 Independent 40/45A ESCs for Outstanding Performance, Reliability & Ease of Maintenance
- Direct Drive Architecture, w/o gears & servos, offers Reliability and Ease of Maintenance
- Square Anti-Twist Mount Impact Resistant Propellers with low-noise operation
- Higher Payload suited for professional camera & video equipment
- High Capacity Batteries (2 x 5300mAh) or (1 x 10,000mAh) for extended flight time
- Optional Two or Three Axis Anti-Shock Camera Mount (available)

1.5 Specifications

- Dimensions including propellers, no gimbal: 1310mm diameter (Tip to tip with 15inch props) × 175mm height without gimbal 173 mm
- Motor: 6 x Outrunner Brushless Motors
- ESC: 6 x 40A Electronic Speed Controllers
- Propellers: 3 x CW and 3x CCW, 15/17"
- Receiver & Transmitter Requirements: 2.4GHz 7 to 12 Channel RX/TX Pair
- Standard Battery: LiPo 6S (22.2v). Flight time of 25 min with GoPro installed.
- Weight without Battery & Camera mount: 7 lbs.
- Maximum Payload: 10 lbs.
- Wind Tolerance: Class 5

1.6 Flight controller specification

| | |
|---------------------------------|---|
| Support Multi-Rotor: | Quad-rotor +4, X4 / Hex-rotor +6, X6, Y6, Rev Y6, Octo-rotor X8, +8, V8 |
| Supported ESC output: | 400Hz refresh frequency |
| Recommended Transmitter: | PCM or 2.4GHz with minimum of 7 channels and Fail-Safe function available on all channels |

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| | |
|--------------------------------------|---|
| Recommended Battery: | 6S LiPo |
| Assistant Software System: | Windows XP SP3 / Windows 7 |
| Requirement: | |
| Power Consumption: | MAX 5W (0.9A@5V, 0.7A@5.8V, 0.5A@7.4V, 0.4A@8V) |
| Operating Temperature: | -5° C to +60° C |
| Hovering Accuracy (GPS Mode): | Vertical: $\pm 0.5\text{m}$, Horizontal: $\pm 2\text{m}$ |
| Maximum Wind Resistance: | < 8m/s (17.9mph / 28.8km/h) |
| Max Yaw Angular Velocity: | 150 deg/s |
| Max Tilt Angle: | 35° |
| Ascent/ Descent: | $\pm 6\text{ m/s}$ |
| Total Weight: | <= 118g (overall) |
| Dimensions: | |
| MC: 51.2mm X 38.0mm X 15.3mm | LED Indicator: 25mmX 25mm X 7mm |
| IMU: 41.4mm X 31.1mm X 27.8mm | PMU: 39.5mm X 27.5mm X 9.7mm |
| GPS & Compass: 50mm (diameter) X 9mm | |
| Built-In Functions: | |
| Three Modes Autopilot | S-Bus Receiver Supported |
| PPM Receiver Supported | 2 Axis Gimbal Support |
| Enhanced Fail-Safe | Intelligent Orientation Control |
| Low Voltage Protection | |

1.7 Packing List

- 1 x Turbo Ace CINEWING 6 Hexcopter (Hub Chassis, 6 x Motors, ESC, Flight Controller)
- 3 x CCW Propellers, 3 x CW Propellers
- 8GB USB flash drive containing the test video, application software, CINEWING 6 User Manual & Setup Guide
- Programming USB-to-Micro USB Cable to link to your PC
- 1 x Velcro Battery Strip
- Batteries: Varies depending on package
- Receiver: Varies depending on package

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1.8 Caution & Safety

- As the operator of the CINEWING 6, it's your responsibility to follow all proper procedures, protocols and precautions to ensure the safe operation of the CINEWING 6. **The operator must wear safety glasses and all bystanders must be protected in a safe area. Do not operate the CINEWING 6 in the proximity of children, pets, cars and other vulnerable property.** The owner and the operator of the CINEWING 6 assumes all liability for any damages caused in the operation of the CINEWING 6, including but not limited to personal injury, equipment and property damage.
- We have programmed model#1 titles as CINEWING 6*** to fly your hexacopter and model#2 as Simulator***, for training with the optional simulator which you may have purchased. Please select the correct model in the transmitter menu before operating any device. Also, please do not make any changes to the program, as failure may occur if you are unfamiliar with the settings. We have created a backup model#8 for your CINEWING 6 in case the program is accidentally altered. Never select "DELETE" in the transmitter menu as it will delete all the programs. Reprogramming the transmitter is a very time consuming task. Wow Hobbies charges a standard rate of \$120/hour for multi rotor servicing, so please be very careful.
- The proper way to carry and transport the CINEWING 6 is to hold onto one, or preferably two of its extension arms near the center hub so that you don't risk bending the arms. Do not carry the CINEWING 6 upside down by its skid because the skid could come loose and the rest of the CINEWING 6 may end up on the floor.
- Since the CINEWING 6 propellers are dismounted for shipping purposes, you must first follow the setup instructions in this user manual to mount the propellers. Any attempt to skip procedures will end in a bad crash.
- **Do not be tempted to fly a large new aircraft such as the CINEWING 6 out-of-the-box, especially after shipping. Prior to its maiden flight, please tie the CINEWING 6 down to a stationary workbench for 3 battery test flights.** Any crashed aircraft is not eligible for Dead-on-Arrival or any other defective equipment claims. If you are new to RC equipment, please seek the help of experienced RC equipment operators to prevent damage and injury.
- **If you choose to use your own radio instead of the one supplied, you must first calibrate your transmitter to the CINEWING 6. If you are using a transmitter other than a Walkera or a Futaba transmitter (e.g. Spektrum**

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and JR) you must also reprogram each ESC independently. Note that due to the large number of available transmitters on the market, we will not be able to support all of them, so we strongly suggest that you use the radio we have supplied. Any attempt to fly without proper transmitter calibration and ESC programming will result in a crash and it will invalidate any DOA (Dead-on-Arrival) claim. If you have purchased an RTF Ready-to-Fly unit (in other words, including the transmitter), please skip these steps.

- Additional Velcro should be added on both the battery strap and the flight battery to prevent the battery from sliding during flight.
- **Operator must tie down CINEWING 6 and dismount all propellers when it is hooked up to a computer.** Any incorrect settings or values may trigger an accidental motor startup. When you need to re-program the CINEWING 6 controller and/or receiver, the power is supplied via your flight battery for any setting or receiver adjustments, including transmitter calibration. Turbo Ace, its distributors, and dealers are not responsible for any service or support once the program has been altered and will not be liable for any damages caused by the mishandling of the CINEWING 6 and its associated equipment.
- **Operator shall use Loctite to secure all necessary screws on the CINEWING 6, including but not limited to skid landing mounts and propeller locking screws. The use of blue Loctite prevents screws and propeller crown caps from coming loose.** Blue Loctite should not come in contact with any plastic. DO NOT use red Loctite, as it can only be removed with the application of higher temperatures.

1.9 DOA (Dead-On-Arrival) Claim

In addition to being assembled and tested at the factory, your main assembly and electronics are tested again in the US before being shipped to you. If your package includes a receiver or transmitter (RTF), the whole package will be tested as a complete set. If you have ordered it without a transmitter (ARF), you will be required to calibrate your transmitter and possibly also the ESCs to the CINEWING 6.

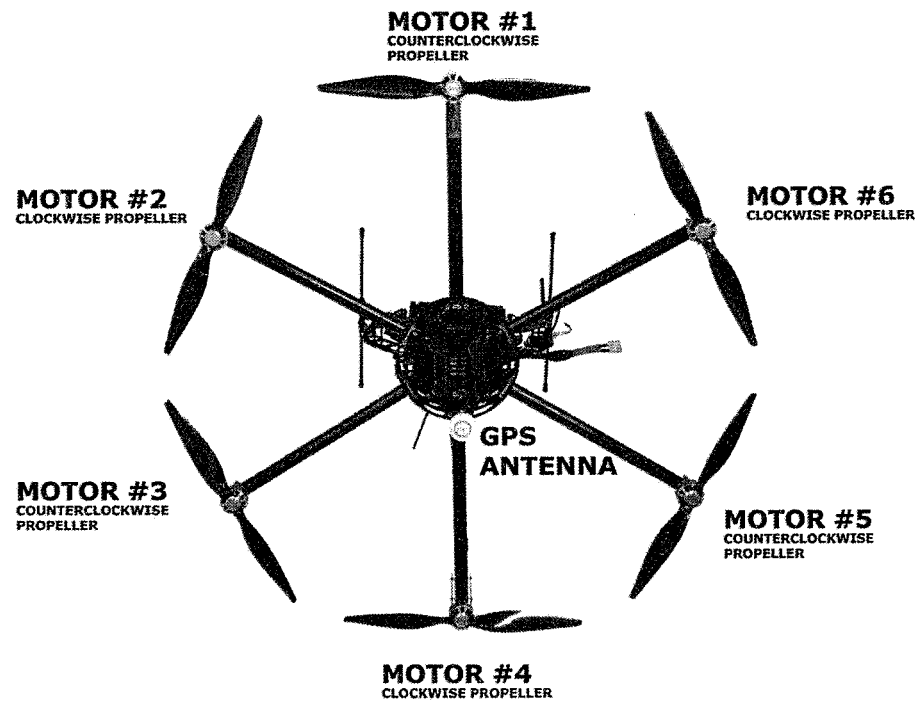
- DOA (Dead-on-Arrival) must be claimed within 24 hours of receipt.
- Report your DOA claims by email to support@wowhobbies.com or go to www.wowhobbies.com and use the “Contact Us” form. Please include your invoice number, product’s name or item number, and a brief description of the problem that you are experiencing. Technical support is only available via email.

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- Please do not return any products without authorization. If you need to return a product for service, you will need to acquire a Return Merchandise Authorization (RMA Number) from the above email or website. If there is no record of your request, your returned product will be rejected.
- No DOA claims can be made once the device has been crashed, including but not limited to blade tips on the ground or any equipment failure after shipping that was not uncovered by skipping the 3 battery test flights with the CINEWING 6 tied down to a bench.
- There is no warranty, return or exchange on RC products

DIAGRAMS & PARTS

2.1 Top View



Turbo Ace CINEWING 6

2.4 Part Specification

| No. | Part | Specifications | QTY | Units | Remarks |
|-----|--------------------------|--|-----|-------|----------|
| 1 | Chassis Cover | ABS Composite Material | 1 | Set | |
| 2 | Arm | High Strength Carbon Fiber Tubing | 6 | PCS | |
| 3 | Skid Landing | Carbon Fiber | 1 | Set | |
| 4 | Motor | 380KV Brushless Motor | 6 | PCS | Special |
| 5 | Propeller | Carbon Propeller | 6 | PCS | Special |
| 6 | PTZ | Fiberglass / Carbon Fiber Two-Dimensional Equilibrium | 1 | Set | Optional |
| 7 | ESC | 6S 40A Electronic Speed Controller | 6 | PCS | Special |
| 8 | Flight Control System | DJI WOOKONG-M or Naza | 1 | PCS | Special |

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2.5 Technical Parameters

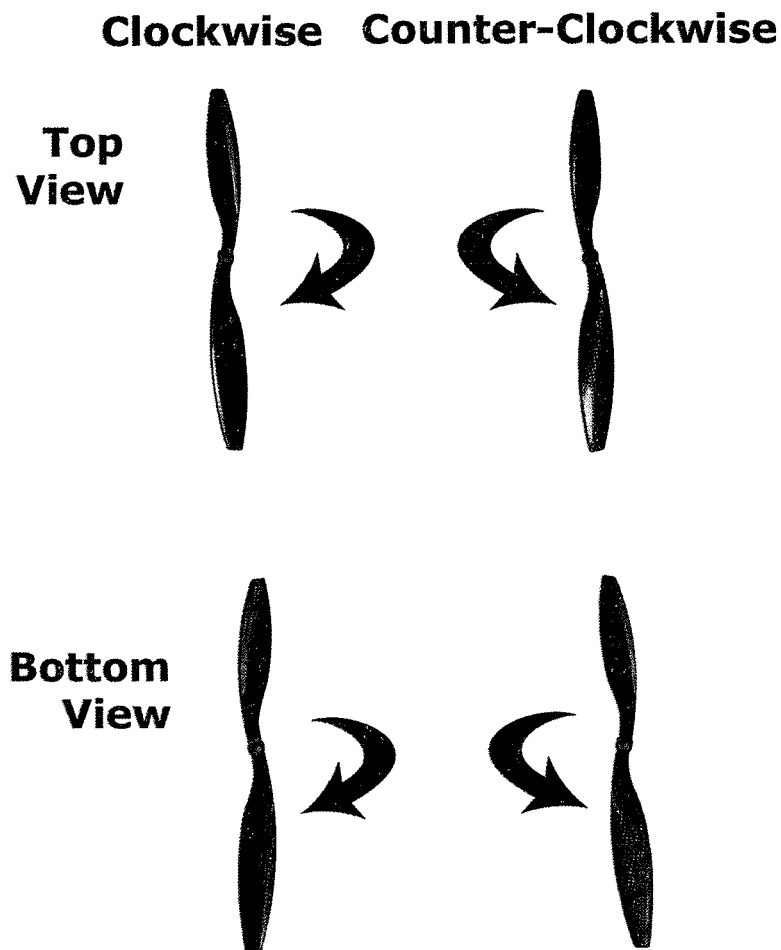
| | | | |
|-------------------------|--|------------|---------------|
| Width | Diameter From Outer Edges of Motors | 983 mm | ±3mm |
| Extended Width | Diameter From Extended Propellers | 1310 mm | |
| Motors Center to Center | Diameter From Center of Motor to Center of Motor on Opposite Side | 935 mm | ±3mm |
| Height | Bottom of Skid Landing to Top of Dome Cover | 173 mm | |
| Propeller | 3 x CW & 3 x CCW (1555 Props use 380kv motors and 1765 use 290kv motors) | 15" or 17" | |
| Battery | LiPo 6S 5300mAh 35C or 10,000mAh | 1 or 2 PCS | |
| Weight | No battery, no gimbal | 7 lbs | ±10g |
| Flight Distance | Limited by Sight & the Receiver/Transmitter | 1-2 miles | |
| Flight Time | 2 x 6S 5300mAh Battery (10,600mAh total) | 25 minutes | No wind hover |
| Wind strength | tolerance | Class 5 | |

CINEWING 6 SETUP

3.1 Unpacking the CINEWING 6

Remove all CINEWING 6 contents from the box. Do not pull on the transmitter antenna to remove the transmitter out of the box, because you might damage the antenna. Instead, pull on the neck strap to remove the unit out of the box.

3.2 Mounting Propellers



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A crucial step in preparing to mount your propellers (props) is to determine which props are clockwise (CW) and which are counter-clockwise (CCW). The first step is to make sure that you are looking at the top of the prop. Make sure that the side with the bearing is facing the ground (Bottom side). Next, look at the part of the blade right next to the center of the prop. The blade will have one edge higher than the other. The higher edge is considered the leading edge of the blade. Looking to the blade on the right side, if the leading edge is towards you (assuming that the prop is horizontally oriented), then the prop will rotate clockwise. If the leading edge is facing away from you, then the prop will rotate counter-clockwise. There are a total of 8 propellers in your package. 3 of the propellers are counter-clock-wise (CCW) type propellers. The other 3 propellers are marked as clock-wise (CW) type propellers. Each type of propeller must be mounted on a specified motor on the CINEWING 6- please refer to the diagram in Section 2.1 Top View of the CINEWING 6.

- (1) Unscrew the screws and remove the propeller cover.
- (2) Due to the precision needed to reduce vibration, the propellers are designed to fit tightly on the motors. Insert each type of propeller to each specified motor location. Motors 1 & 3 & 5 use counter-clock-wise propellers and motors 2 & 4 & 6 use clock-wise propellers. Please make sure that they match exactly (see top view figure on Diagram and Parts section). Failure to mount the correct propeller(s) will result in a crash. The propellers that come with the CINEWING 6 are custom enforced for stability and are stiffer and stronger than stock propellers available in the market. Using alternative propellers may cause video vibration.
- (3) It is very important to put some Loctite on the inside of each screw before securing it to the propeller. Over tightening the screws may damage the motor aluminum threads. Repeat this for all 6 propellers.

IMPORTANT: Every time you remove the propellers, you need to reapply some Loctite and let it dry.

3.4 Battery Requirements & Installation

- (1) Standard Battery: 6-S LiPo, 22.2V, 5300mAh, 35C, 2 PCS or one 10,000mAh
- (2) Release the wide Velcro strap near the top cover.
NOTE: The center of gravity is best accomplished with the battery mounted on the top cover.
- (3) Do not plug in the main battery power to the CINEWING 6 at this time.

ELECTRONICS SETUP & ADJUSTMENT

If you have purchased an RTF package (CINEWING 6 with transmitter), please skip Sections 4.1 through 4.5, because all settings have been completed and your CINEWING 6 and transmitter have been calibrated, paired, and test-flown as a set. Unless you are familiar with the settings, any changes might override the factory's settings and disable the aircraft, affecting its performance and flight reliability.

If you have purchased an ARF package (CINEWING 6 without transmitter) and you have a Walkera or Walkera Devention transmitter, you can skip Section 4.1 and go directly to Section 4.2 for the Transmitter Calibration. In order for a flight controller to work properly, your specific transmitter has to be calibrated to work with each new CINEWING 6. Crashes will be imminent if you skip this one time procedure to match a CINEWING 6 with a transmitter.

If you have purchased an ARF package (CINEWING 6 without transmitter) and you are not using a Walkera or Futaba transmitter, you must complete Section 4.1 ESC Programming and Section 4.2 Transmitter Calibration. CINEWING 6 ESCs were originally programmed to work with Walkera and Futaba transmitters. To use the same ESCs on Spektrum, JR or other transmitters, the end user needs to reprogram each ESC independently. Also, in order for a flight controller to work properly, your specific transmitter has to be calibrated to work with each new CINEWING 6. Crashes will be imminent if you skip these one-time procedures to match a CINEWING 6 with a transmitter.

4.1 ESC Programming for Spektrum DX 8 Transmitter (Required Setup For ARF)

Video Instruction:

How to calibrate the ESC for CINEWING 6:

<https://www.dropbox.com/s/qwvt489g9j6zs7x/Calibration%20for%20Spektrum%20ESCs.MP4>

Please skip this ESC programming step if you have purchased an RTF unit, since all ESCs have been re-programmed. If you purchased an ARF unit, please follow the steps below very carefully. The procedure will only take a few minutes.

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- (1) **IMPORTANT:** Remove all 6 propellers from the motors for safety.
- (2) Double check to make sure all ESC connectors are marked/labeled (#1 through #6, matching the connectors on the flight controller #1 through #6) so that you will be able to keep track of the corresponding connectors when you need to put them back later.
- (3) Disconnect all 6 ESC connectors from the WooKong/NAZA flight controller so they will not interfere with each other's programming.
- (4) Move the throttle stick all the way down. Now turn on the transmitter.
- (5) Disconnect X3 on the NAZA flight controller and plug it into AUX 1 on the receiver.
- (6) Insert the #1 labeled ESC connectors into the receiver's throttle channel port while watching for the correct polarity. Black/dark brown wires are usually on the edge of the receiver. Please verify polarity in your receiver manual if you are not using the stock receiver. (Make sure the Receiver and Transmitter radio are bound)
- (7) Move the throttle stick all the way up.
- (8) Within 3 seconds, connect the battery to the CINEWING 6 battery plug (The CINEWING 6 battery plug is still connected to all 6 ESCs but only one ESC should be connected to the receiver at a time.)
- (9) When the ESC makes 1 beeping sound, immediately move the throttle stick all the way down. The ESC will then make 2 beeping sounds (If you did not hear the 1 beeping sound when entering programming mode or you did not hear 2 beeping sounds after the ESC completed its programming, then you need to move throttle all the way down and disconnect the battery from the CINEWING 6 battery plug and repeat Steps (6) to (9) for the ESC. If you did not experience any problems, then you have completed programming for this ESC, which now retains the high and low end point data in its memory. Disconnect the battery from the CINEWING 6's battery connector, then disconnect the ESC connector from the receiver.
- (10) Repeat Steps (6) to (9) for each ESC. Please make sure you have programmed all 4 ESCs by starting with the #1 labeled ESC and finishing with #6 labeled ESC. Your transmitter power should remain in the power on position throughout the entire process of programming all 6 ESCs.
- (11) After you have successfully re-programmed all 4 ESCs, unplug the battery from the CINEWING 6 battery plug. Insert the 6 ESC connectors, labeled #1 through #6, back to corresponding M1 through M6 ports on your

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WooKong/NAZA flight controller. The black/dark brown wire (-) for each ESC connector is closest to the red NAZA label of the flight controller.

4.1 ESC Programming for Futaba 14SG Transmitter (Required Setup For ARF)

Video Instruction:

How to calibrate the ESC for CINEWING 6:

<https://www.dropbox.com/s/z09ojui7ptd4rxr/1.%20Futaba%20Esc%20Programing.MP4>

Please skip this ESC programming step if you have purchased an RTF unit, since all the ESCs have been re-programmed. Please follow the steps below very carefully. They will only take a few minutes.

- (1) **VERY IMPORTANT:** Remove all 6 propellers from the motors for safety.
- (2) Double check to make sure all ESC connectors are marked/labeled (#1 through #6 matching the connectors on the flight controller #1 through #6) so that you will be able to keep track of the corresponding connectors when you need to put them back later.
- (3) Disconnect all 6 ESC connectors from the NAZA flight controller so they may not interfere with each other's programming.
- (4) Move the throttle stick all the way down. Now turn on the transmitter.
- (5) Disconnect X3 on the NAZA flight controller and plug into port 8 on the receiver.
- (6) Turn on Futaba radio→double tap "LNK"→go to "Reverse"→go to THR and set it to "REV"
- (7) Insert one of the labeled ESC connectors into the receiver's throttle channel (wow default port 3) port while watching for the correct polarity. Black/dark brown wires are usually on the edge of the receiver. Please verify polarity in your receiver manual if you are not using the stock receiver.
- (8) Move the throttle stick all the way up.
- (9) Within 3 seconds, connect the battery to the CINEWING 6's battery plug (The CINEWING 6 battery plug is still connected to all 6 ESCs but only one ESC should be connected to the receiver at a time).
- (10) When the ESC makes 1 beeping sound, immediately move the throttle stick all the way down. The ESC will then make 2 beeping sounds (If you did not hear the 1 beeping sound when entering programming mode or you did not

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hear 2 beeping sounds after the ESC completed its programming, then you need to move throttle all the way down, disconnect the battery from the CINEWING 6 battery plug and repeat Steps (7) to (10) for the ESC. If you did not experience any problems, then you have completed programming on this ESC which now retains the high and low end point data in its memory. Disconnect the battery from the CINEWING 6's battery connector then disconnect the ESC connector from the receiver.

- (11) Repeat this process for each ESC from Step (7) through Step (10). Please make sure you have programmed all 6 ESCs by starting with the #1 labeled ESC and finishing with #6 labeled ESC. Your transmitter power should remain in the power on position throughout the entire process of programming all 6 ESCs.
- (12) After you have successfully re-programmed all 6 ESCs, unplug the battery from the CINEWING 6 battery plug.
- (13) Now reverse the throttle back to normal on Futaba radio→double tap “LNK”→go to “Reverse”→go to THR and set it to “NORM”
- (14) Insert the 6 ESC connectors, labeled #1 through #6 back to corresponding M1 through M6 ports on your NAZA flight controller. The black/dark brown wire (-) for each ESC connector is closest to the red NAZA label of the flight controller.

4.2 Transmitter Calibration for Spektrum DX 8 Transmitter (Required Setup For ARF)

Video Instruction:

1. How to set up fail safe for Spektrum transmitter:
<https://www.dropbox.com/s/pw2nogpjubwaubj/3.%20Failsafe%20SPK.MP4>
2. How to set up Spektrum transmitter calibration:
<https://www.dropbox.com/s/z64exwcmna634j6/4.%20TX%20Calibration%20Settings%20SPK.MP4>
3. How to fine tune Spektrum transmitter:
<https://www.dropbox.com/s/8ybf61e6o8bxae/5.%20Fine%20Tune%20SPK.MP4>
4. How to set up the gain setting:
<https://www.dropbox.com/s/2pkkn3ipc73tbwy/7.%20Gain%20Setup.MP4>

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If you purchased your CINEWING 6 with a transmitter (RTF package) please skip this section because we have already completed calibration. If you are using a transmitter that has never been paired with your new CINEWING 6, you will need to calibrate your transmitter to the CINEWING 6 flight controller using the following procedure. Any change to the hexacopter or setting change to the transmitter might require transmitter calibration.

- (1) **VERY IMPORTANT:** Remove all 6 propellers from the motors for safety.
- (2) Tie down your CINEWING 6
- (3) Turn on your transmitter radio.
- (4) Connect battery to the CINEWING 6 battery connector.
- (5) Connect the provided Programming USB Cable from your PC computer's USB port (XP or WIN7 or WIN8) to the Micro USB port on the CINEWING 6 communication port (on the LED side panel of the CINEWING 6). (If the computer does not recognize the USB, the USB driver is located in the provided 8GB USB flash drive)
- (6) Double click on the NAZAINstaller.exe, located in the provided 8GB USB flash drive, and install the NAZA ASSISTANT SOFTWARE.
- (7) Double click on the application file named NAZA ASSISTANT SOFTWARE. Wait for the program to start up.
- (8) Click **MOUNTING** Use to input the distance between GPS and Main Flight Controller.
- (9) Click **MOTOR MIXER**
MIXER TYPE: Please select **Hexa-rotor I** and remember to click WRITE after you update any settings (WRITE is #7 on top of FIGURE 4.2)
- (10) Click **TX CALI**

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- Directional Stick controls “E” (Elevator): Stick down and “E” slides left (tilts back) & stick up and “E” slides right (tilts forward)
- Directional Stick controls A (Aileron): Stick left and “A” slides left (roll left) & stick right and “A” slides right (roll right).

After Calibration, place all sticks at the center which will turn all sliders green. At this point click **FINISH** to end.

(14) STICKS MONITOR is not used at this time.

(15) CONTROL MODE SWITCH: (Please see Section 4.7 CINEWING 6 Wiring Connection Chart)

Setting the GPS Attitude and Attitude and Manual Mode on the Flap Switch on Spektrum DX8 Transmitter

Setting the GPS, Attitude and Manual Mode on the Flap Switch on CINEWING 6:

- (1) The NAZA Assistant screen should show a Control Mode Switch with GPS | Fail Safe | A | Fail Safe | M. (The “GPS” represent the GPS Mode, the “A” represent “Attitude Mode” and the “M” represent “Manual Mode”). You need a 3 position switch for the Control Mode Switch. For example: When using Spektrum DX8 and AR8000, the Control Mode Switch is assigned to the Flap switch on the transmitter. This is done by connecting the Receiver’s AUX1 channel to the Flight Controller’s “U” channel (See FIGURE 4.2). Hold down roller while turning on the Spektrum DX8→scroll down to “Switch Select”→scroll down to “Flap” press roller→change to “AUX 1” (If you cannot find Flap in the list, you will need to change the model type to “Airplane”, in order for “Flap” to show up in the selection.
- (2) Now you need to make sure when the Flap Switch is flipped forward (away from you) the switch will change the flight controller to “GPS Mode.” If the Control Mode Switch (See FIGURE 4.2 bottom) slider is closer to “M” or “A”, then the Control Mode Switch slider is in the wrong position. To bring the slider closer to “GPS.” Turn on transmitter→Click on roller→scroll down to “Servo Setup”→scroll to “travel” and click on roller, which will have a flashing box→scroll to “Reverse”, click the roller to make the flashing box become solid →scroll down to “Throttle” and change to “AUX 1”→scroll down to the NOR and REV box→ click the roller to reverse the AUX 1 channel (which is now set to your Flap Switch setting). This change will bring the Control Mode Switch slider closer to “GPS.”

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- (3) How to set up fail safe for Spektrum transmitter, please following the instruction in the video link below
<https://www.dropbox.com/s/pw2nogpjubwaubj/3.%20Failsafe%20SPK.MP4>
- (4) Move your Flap Switch to the middle position to set the sub trim for the middle position first. If the “A” segment turns blue please skip to Step (6).
- (5) If the “A” segment does not turn blue, Click on roller→scroll down to “Servo Setup”→scroll to “travel” and click on roller, which will have a flashing box→scroll to “subtrim”, click the roller to make the flashing box become solid →scroll down to “Throttle” and change to “AUX 1”→scroll down to the 0 and adjust the until “A” segment turns blue.
- (6) Flip the Flap Switch forward (away from you). If the “GPS” segment turns blue then skip to Step (8).
- (7) If the “GPS” segment does not turn blue, Click on roller→scroll down to “Servo Setup”→scroll to “travel” and click on roller, which will have a flashing box→ scroll down to “Throttle” and change to “AUX 1”→scroll down to the 100% and adjust the value until “GPS” segment turns blue.
- (8) Flip the Flap Switch backward (towards you). If the “M” segment turns blue then skip to Section 4.2.11.
- (9) If the “M” segment does not turn blue, Click on roller→scroll down to “Servo Setup”→scroll to “travel” and click on roller, which will have a flashing box→ scroll down to “Throttle” and change to “AUX 1”→scroll down to the 100% and adjust the value until “M” segment turns blue. Make sure to test the failsafe by turn off your transmitter and the slider should move to failsafe and turn blue and the throttle will go to midpoint on the screen.

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- (1) BASIC PARAMETERS: Recommend setting for Pitch set to 130%, Roll set to 120%, Yaw set to 90% and Vertical set to 120% and ATTITUDE GAIN is Pitch set to 100% and Roll set to 100%. REMOTE ADJUST is set to INH. Basic Gain and Attitude Gain should never set to lower than 100%, otherwise crash might result.
- (2) ENHANCED FAILED-SAFE METHODS. (GPS module is required). Recommended setting for enhanced failed-safe methods is to set it to GO-HOME and LANDING. (Please refer to DJI NAZA User Manual's page 21 for enhanced failsafe methods).
- (3) INTELLIGENT ORIENTATION CONTROL (IOC): (GPS module is required). Check the box next to “3. Intelligent Orientation Control.” If GPS is

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installed, the settings for Spektrum DX 8 and AR8000 as follows. Assign the intelligent orientation control to the F MODE Switch on the transmitter, connecting the Receiver's Gear channel to the Flight Controller's "X2" channel (See FIGURE 4.2). Hold the roller while turning on the Spektrum DX8→scroll down to "Switch Select"→scroll to "Gear" change to "Inh"→scroll to "F MODE" change to "Gear."

- (4) Now you need to make sure when the F MODE Switch is flipped forward (toward the ground) the switch will change the Intelligent Orientation Control to "Off." If the slider is closer to "Course Lock" or "Home Lock", then the Intelligent Orientation Control Switch slider is in the wrong position. To bring the slider closer to "Off." Turn on transmitter→click on roller→scroll to "Servo Setup"→scroll to "Travel", click on roller, which will have a flashing box→ scroll down to "Reverse"→scroll down to "Throttle" and change to "Gear"→scroll down to NOR & REV to reverse your Channel Gear setting to "REV" (which is now set to your F MODE Switch setting). This change will bring the Intelligent Orientation Control Switch slider closer to "Off."
- (5) Move your F MODE Switch to the middle position to set the midpoints for the middle position first. If the "Course Lock" segment turns blue please skip to Step (4).
- (6) If the "Course Lock" segment does not turn blue, click on roller→scroll to "Servo Setup"→scroll to "Travel" and change to "subtrim"→scroll down to "Throttle" and change it to "Gear"→scroll down to "0"→adjust the value until "Course Lock" segment turns blue.
- (7) Flip the F MODE Switch forward (toward the ground). If the "Off" segment turns blue then skip to Step (6).
- (8) If the "Off" segment does not turn blue, click on roller→scroll to "Servo Setup"→scroll to "Travel"→scroll down to "Throttle" and change it to "Gear"→scroll down and adjust the value until "Off" segment turns blue.
- (9) Flip the F MODE Switch backward (towards the sky). If the "Home Lock" segment turns blue.
- (10) If the "Home Lock" segment does not turn blue, click on roller→scroll to "Servo Setup"→scroll to "Travel"→scroll down to "Throttle" and change it to "Gear"→scroll down and adjust the value until "Home Lock" segment turns blue.

Home Lock only activates while CINEWING 6 is about 30 feet (10 meters) away from the home position (Takeoff Position). To change the Home Lock position during

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flight, please refer to the DJI User Manual for detailed descriptions and functions of HOME LOCK and COURSE LOCK.

4.2 Transmitter Calibration for Futaba 14SG Transmitter (Required Setup For ARF)

Video Instruction:

1. How to connect Futaba RX and setup Futaba TX:
<https://www.dropbox.com/s/vztqrwhplxq3h80/2.%20Futaba%20RX%20Setup.MP4>
2. How to set up fail safe for Futaba transmitter:
<https://www.dropbox.com/s/63n1ylwy4lnv17y/6.%20Futaba%20Control%20Mode%20Failsafe.MP4>
3. How to set up Futaba transmitter calibration:
<https://www.dropbox.com/s/www2w6pyba91ra9/5.%20Futaba%20TX%20Callibration.MP4>
4. How to set up the gain setting:
<https://www.dropbox.com/s/2pkkn3ipc73tbwy/7.%20Gain%20Setup.MP4>
5. How to set up advanced setting:
<https://www.dropbox.com/s/76vv670q6jb99lu/8.%20Advanced%20Setup.MP4>
6. How to set up the voltage setting:
<https://www.dropbox.com/s/clsrc9ixxp8b2xn/9.%20Voltage%20Setup.MP4>

If you have purchased your CINEWING 6 with a transmitter (RTF package) please skip this section because we have already completed calibration. If you are using a transmitter that has never been paired with your new CINEWING 6, you will need to calibrate your transmitter to the CINEWING 6 flight controller using the following procedure. Any change to the hexacopter or setting change to the transmitter may require transmitter calibration.

- (1) **VERY IMPORTANT:** Remove all 6 propellers from the motors for safety.
- (2) Tie down your CINEWING 6.
- (3) Turn on your transmitter radio.
- (4) Connect battery to the CINEWING 6 battery connector.
- (5) Connect the provided Programming USB Cable from your PC computer's USB port (XP or WIN7 or WIN8) to the Micro USB port on the CINEWING 6 communication port (on the LED side panel of the CINEWING 6). (If the computer does not recognize the USB, the USB driver is located in the provided 8GB USB flash drive)

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direction, click the NORM or REV to reverse the direction of the slider movement.

- Throttle/Yaw Stick controls “T” (Throttle): Stick down and “T” slides left (reduce power) & stick up and “T” slides right (increase power).
- Throttle/Yaw Stick controls “R” (Rudder): Stick left and “R” slides left (nose to the left) & stick right and “R” slides right (nose to the right).
- Directional Stick controls “E” (Elevator): Stick down and “E” slides left (tilts leans back) & stick up and “E” slides right (tilts forward)
- Directional Stick controls A (Aileron): Stick left and “A” slides left (leans left) & stick right and “A” slides right (leans right).

After Calibration, place all sticks in the center, which will turn all sliders green. At this point, click **FINISH** to end.

(14) STICKS MONITOR is not used at this time.

(15) CONTROL MODE SWITCH: (Please see Section 4.8 CINEWING 6 Wiring Connection Chart)

Setting the GPS Attitude, Attitude and Manual Mode on the SB Switch on Futaba 14SG Transmitter:

Setting the GPS, Attitude and Manual Mode on the Mix Switch on CINEWING 6:

- (1) The NAZA Assistant screen should show a Control Mode Switch with GPS | Fail Safe | A | Fail Safe | M. (The “GPS” represents the GPS Mode, the “A” represents “Attitude Mode” and the “M” represents “Manual Mode”). You need a 3-position switch for the Control Mode Switch. For example: When using Futaba 14SG and R7008SB, the Control Mode Switch is assigned to the SB switch on the transmitter. This is done by connecting the Receiver’s 5 channel to the Flight Controller’s “U” channel (See FIGURE 4.2). Turn on the Futaba 14SG, double tap “LNK”→scroll down to “Function” press “RTN”→scroll down to channel 5→Change CTRL to “SB.”
- (2) Now you need to make sure that when the SB Switch is flipped forward (away from you), the switch will change the flight controller to “GPS Mode.” If the Control Mode Switch (See FIGURE 4.2 bottom) slider is closer to “M” or “A”, then the Control Mode Switch slider is in the wrong position. To bring the slider closer to “GPS”, double tap “LNK”→scroll down to “REVERSE”

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→scroll down to Channel 5→tap “RTN” and reverse your Channel 5 setting to “REV” (which is now set to your SB Switch setting). This change will bring the Control Mode Switch slider closer to “GPS.”

- (3) Transmitter can be turned on and off to bind and re-bound, which will make fail safe testing easier. To setup Fail-Safe, double tap “LNK”→scroll down to “END POINT”→scroll down to Channel 5→adjust travel value until the failsafe turn blue→double tap “LNK”→scroll down to “FAIL SAFE”→scroll down to Channel 5→scroll to F/S and change to “F/S”→scroll to “POS,” hold “RTN” for 1 second, and it will set the value for failsafe automatically.
- (4) Move your SB Switch to the middle position to set the sub trim for the middle position first. If the “A” segment turns blue, please skip to Step (6).
- (5) If the “A” segment does not turn blue, double tap “LNK”→scroll down to “SUB-TRIM”→scroll down to Channel 5→change the value until “A” segment turns blue.
- (6) Flip the SB Switch forward (away from you). If the “GPS” segment turns blue, then skip to Step (8).
- (7) If the “GPS” segment does not turn blue, double tap “LNK”→scroll down to “ENDPOINT”→scroll down to Channel 5→find the travel value and tap “RTN”→value will flash and you can change the value until “GPS” segment turns blue.
- (8) Flip the SB Switch backward (towards you). If the “M” segment turns blue, then skip to Section 4.2.11.
- (9) If the “M” segment does not turn blue, double tap “LNK”→scroll down to “ENDPOINT”→scroll down to Channel 5→ find the travel value and tap “RTN”→value will flash and you can change the value until “M” segment turns blue. Make sure to test the failsafe by turning off your transmitter. The slider should move to failsafe and turn blue.

AUTO PILOT

- (1) BASIC PARAMETERS: Recommended settings are Pitch set to 130%, Roll set to 120%, Yaw set to 90%, and Vertical set to 120%. ATTITUDE GAIN is Pitch set to 100% and Roll set to 100%. REMOTE ADJUST is set to INH. Basic Gain and Attitude Gain should never be set to lower than 100%, otherwise crashes may result.
- (2) ENHANCED FAILED-SAFE METHODS. (GPS module is required). Recommended settings for enhanced failed-safe methods is to set to

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GO-HOME and LANDING (Please refer to DJI NAZA User Manual's page 21 for enhanced failed-safe methods).

- (3) INTELLIGENT ORIENTATION CONTROL (IOC): (GPS module is required). Check the box next to "3. Intelligent Orientation Control." If GPS is installed, the settings for Futaba 14SG and R7008SB are as follows: Assign the intelligent orientation control to the SE Switch on the transmitter, connecting the Receiver's 6 channel to the Flight Controller's "X2" channel (See FIGURE 4.2). Turn on the Futaba 14SG, double tap "LNK"→scroll down to "Function" press "RTN"→scroll down to channel 6→Change CTRL to "SE."
- (4) Now you need to make sure that when the SE Switch is flipped forward (toward the ground) the switch will change the Intelligent Orientation Control to "Off." If the slider is closer to "Course Lock" or "Home Lock", then the Intelligent Orientation Control Switch slider is in the wrong position. To bring the slider closer to "Off",
double tap "LNK"→scroll down to "REVERSE" →scroll down to Channel 6→tap "RTN" and reverse your Channel 6 setting to "REV" (which is now set to your SE Switch setting). This change will bring the Intelligent Orientation Control Switch slider closer to "Off."
- (5) Move your SE Switch to the middle position to set the midpoints for the middle position first. If the "Course Lock" segment turns blue, please skip to Step (4).
- (6) If the "Course Lock" segment does not turn blue, double tap "LNK"→scroll down to "SUB TRIM"→scroll down to Channel 6→adjust the value until "Course Lock" segment turns blue.
- (7) Flip the SE Switch forward (toward the ground). If the "Off" segment turns blue, then skip to Step (6).
- (8) If the "Off" segment does not turn blue, double tap "LNK"→scroll down to "END Point"→scroll down to Channel 6→find the travel value and tap "RTN"→adjust the value until "Off" segment turns blue.
- (9) Flip the SE Switch backward (towards the sky) if the "Home Lock" segment turns blue.
- (10) If the "Home Lock" segment does not turn blue, double tap "LNK"→scroll down to "END Point"→scroll down to Channel 6→find the travel value and tap "RTN"→adjust the value until "Home Lock" segment turns blue.

Home Lock only activates while CINEWING 6 is at about 30 feet (10 meters) away from the home position (Takeoff Position). To change the Home Lock position during

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flight, please refer to the DJI User Manual for detailed descriptions and functions of HOME LOCK and COURSE LOCK.

4.3 Transmitter & Receiver Compatibility Table (For ARF Only)

The CINEWING 6 prefers a 2.4GHz system, but also supports 35MHz, 40MHz, and 72MHz.

| No. | Brand | Transmitter | Receiver |
|-----|----------|--------------|----------|
| 1 | Walkera | DEVENTION 10 | RX1002 |
| 2 | Spektrum | DX8 | AR8000 |
| 3 | JR | DSX7 | RD721 |
| 4 | JR | 9XII | |
| 5 | WFLY | FT06-C | FRP06 |
| 6 | Futaba | FF9 | R149DP |
| 7 | Futaba | 6EX | R146iP |
| 8 | Futaba | 10C | |
| 9 | Sanwa | RD8000 | 92777 |
| 10 | Hi-TEC | Eclipse7 | FRP06 |

4.4 Receiver, Flight Controller & Auto-stabilization Setup for Spektrum DX8

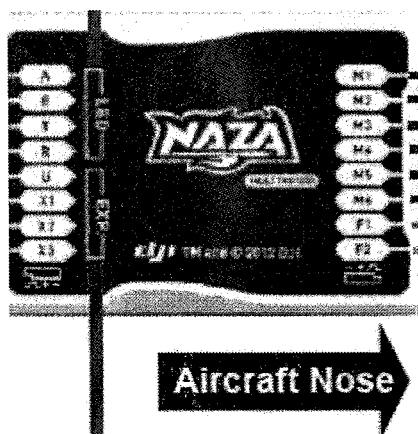


FIGURE 4.4

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- (1) Connect Channel #T wire from the flight controller to the THROTTLE channel of the receiver. Watch for polarity.
- (2) Connect Channel #E wire from the flight controller to the ELEV channel of the receiver.
- (3) Connect Channel #A wire from the flight controller to the AILE channel of the receiver.
- (4) Connect Channel #R wire from the flight controller to the RUDDER channel of the receiver.
- (5) Connect Channel #U wire from the flight controller to the AUX 1 channel of the receiver.
- (6) Connect Gyrox Brushless gimbal tilt control cable to the AUX 3 channel of the receiver.
- (7) Connect Channel #X2 wire from the flight controller to the GEAR channel of the receiver.
- (8) Connect Channel #X3 wire from the flight controller to the LED Versatile Unit (PMU).

Setting up CINEWING 6 to ensure a smooth flight with GPS or Attitude mode

To ensure the smooth flight of your Turbo Ace CINEWING 6, please make sure that you setup and fly the CINEWING 6 in GPS or Attitude mode. In order for GPS or Attitude mode to function, first it is important to make sure the flap switch on your radio is all the way forward. Please refer to Section 4.2 Transmitter Calibration. If you own a Spektrum radio such as the DX8, you will need to reverse the gear channel in your radio so that when you flip the gear switch forward, it enables GPS or Attitude Mode. If you are experiencing difficulties in handling the aircraft, it may be because it is not in GPS or Attitude Mode.

You may skip the following setup instructions if you have purchased the Turbo Ace CINEWING 6 with a transmitter radio, as we have already completed all the setup for you. If you have purchased a CINEWING 6 without a radio, please see the following to make sure your radio is setup correctly.

Setting up and checking Turbo Ace CINEWING 6 flight mode for GPS or Attitude Mode.

Plug in a 3 pin cable connector to the "INPUT" channel U of the NAZA flight controller. Connect the other end of the cable to the AUX 1 output on your receiver

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with the brown wire closest to the edge of the receiver casing (If you have a receiver other than a Walkera, Devention or Spektrum, please check your receiver manual for polarity).

CINEWING 6 with GPS module (Assign AUX 1 to 3 position toggle switch, WOW default Flap switch for Spektrum DX 8):

Hold down roller while turning on the Spektrum DX8→scroll down to “Switch Select”→scroll down to “Flap” press roller→change to “AUX 1” (If you cannot find Flap in the list, you will need to change the model type to “Airplane” in order for “Flap” to show up in the selection. This means that every time the **Flap** switch is flipped forward on your radio, it will toggle the AUX 1 output of the receiver and tell the controller to perform GPS Mode. For Spektrum radio, you will need to change from normal to reverse on the AUX 1 channel in your radio so that when you flip the Flap switch forward on the radio, you are activating the GPS mode. The reason to setup the radio this way is to ensure everything is in the correct default mode when all the switches on your radio are all the way forward (away from you). You can use the NAZA Assistant Software to double check the Flap switch operation after you have completed the above setup.

Turn on your transmitter radio (Warning: Always tie down the CINEWING 6 and remove all propellers when you perform any setting changes to the transmitter or NAZA Assistant Software. Failure to do so may cause serious issues, as the CINEWING 6 motor may start up if an incorrect value is entered). Connect the provided Programming USB-to-Micro USB cable from your PC computer’s USB port (XP or WIN7) to Micro USB port on the CINEWING 6 communication port (on the LED side panel of the CINEWING 6). Please connect this cable after the transmitter is bound to the receiver.

Double click on NaZaInstaller.exe, located in the provided 8GB USB flash drive, to install the NAZA ASSISTANT SOFTWARE

After the complete installation of the NAZA ASSISTANT SOFTWARE, double click on the application file named NAZA ASSISTANT SOFTWARE. Wait for the program to start up.

Select the TX Calibration tab at the left column of the screen.

CINEWING 6 with GPS

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You will see the 5 mode tabs: GPS, Fail Safe, A, Fail Safe, M. When you flip the Flap switch on your radio, you will see the selection flipping between GPS and A and M. When the Flap switch is flipped forward, you will see GPS is selected, which enables GPS Mode. The GPS Mode is the mode you should be using to fly your CINEWING 6. M mode has no stabilization and will make it very difficult to operate the aircraft.

IMPORTANT: Make sure that the Flap switch on your radio is in the forward/middle position before taking off and during the entire flight. (Please refer to section 4.2 Transmitter Calibration if GPS and A and M mode do not turn blue on the screen when you flip the Flap switch).

4.4 Receiver, Flight Controller & Auto-stabilization Setup for Futaba 14SG

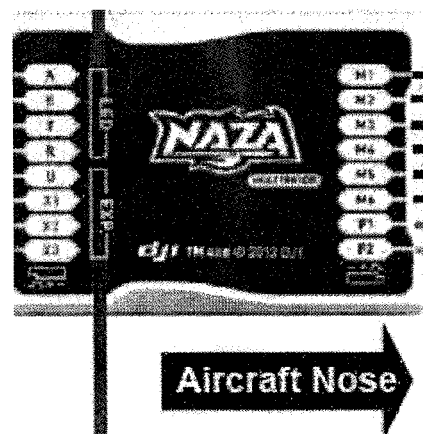


FIGURE 4.4

- (1) Connect Channel #A wire from the flight controller to the channel 1 of the receiver.
- (2) Connect Channel #E wire from the flight controller to the channel 2 of the receiver.
- (3) Connect Channel #T wire from the flight controller to the channel 3 of the receiver. Watch for polarity.
- (4) Connect Channel #R wire from the flight controller to the channel 4 of the receiver.
- (5) Connect Channel #U wire from the flight controller to the channel 5 of the receiver.
- (6) Connect Channel #X2 wire from the flight controller to the channel 6 of the receiver.

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- (7) Connect Gyrox Brushless gimbal tilt control cable to the channel 7 of the receiver.
- (8) Connect Channel #X3 wire from the flight controller to the LED Versatile Unit (PMU).

Setting up CINEWING 6 to ensure a smooth flight with GPS or Attitude mode

To ensure the smooth flight of your Turbo Ace CINEWING 6, please make sure that you setup and fly the CINEWING 6 in GPS or Attitude mode. In order for GPS or Attitude mode to function, first it is important to make sure the mix switch on your radio is all the way forward. Please refer to Section 4.2 Transmitter Calibration. If you are experiencing difficulties in handling the aircraft, it may be because it is not in GPS or Attitude Mode.

You may skip the following setup instructions if you have purchased the Turbo Ace CINEWING 6 with a transmitter radio, as we have already completed all the setup for you. If you have purchased a CINEWING 6 without a radio, please see the following to make sure your radio is setup correctly.

Setting up and checking Turbo Ace CINEWING 6 flight mode for GPS or Attitude Mode.

Plug in a 3 pin cable connector to the "INPUT" channel U of the NAZA flight controller. Connect the other end of the cable to the Channel 5 output on your receiver with the brown wire closest to the edge of the receiver casing (If you have a receiver other than a Walkera, Devention or Spektrum, please check your receiver manual for polarity).

CINEWING 6 with GPS module (Assign Channel 5 to 3 position toggle switch, WOW default SB switch for Futaba 14SG):

Turn on the Futaba 14SG, double tap "LNK"→scroll down to "Function" press "RTN"→scroll down to channel 5→Change CTRL to "SB." This means that every time the SB switch is flipped forward on your radio, it will toggle the Channel 5 output of the receiver and tell the controller to perform GPS Mode. For Futaba radio, you might need to change from normal to reverse on the AUX 1 channel in your radio so that when you flip the SB switch forward on the radio, you are activating the GPS mode. The reason to setup the radio this way is to ensure everything is in the correct default mode when all the switches on your radio are all the way forward (away from

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you). You can use the NAZA Assistant Software to double check the SB switch operation after you have completed the above setup.

Turn on your transmitter radio (Warning: Always tie down the CINEWING 6 and remove all propellers when you perform any setting changes to the transmitter or NAZA Assistant Software. Failure to do so may cause serious issues, as the CINEWING 6 motor may start up if an incorrect value is entered). Connect the provided Programming USB-to-Micro USB cable from your PC computer's USB port (XP or WIN7) to Micro USB port on the CINEWING 6 communication port (on the LED side panel of the CINEWING 6). Please connect this cable after the transmitter is bound to the receiver.

Double click on NaZaInstaller.exe, located in the provided 8GB USB flash drive, to install the NAZA ASSISTANT SOFTWARE.

After complete installation of the NAZA ASSISTANT SOFTWARE, double click on the application file named NAZA ASSISTANT SOFTWARE. Wait for the program to start up.

Select the TX Calibration tab at the left column of the screen.

CINEWING 6 with GPS

You will see the 5 mode tabs: GPS, Fail Safe, A, Fail Safe, M. When you flip the SB switch on your radio, you will see the selection flipping between GPS and A and M. When the SB switch is flipped forward, you will see GPS is selected, which enables GPS Mode. The GPS Mode is the mode you should be using to fly your CINEWING 6. M mode has no stabilization and will make it very difficult to operate the aircraft.

IMPORTANT: Make sure that the SB switch on your radio is in the forward/middle position before taking off and during the entire flight (Please refer to section 4.2 Transmitter Calibration if GPS and A and M mode do not turn blue on the screen when you flip the Flap switch).

4.5 Transmitter Settings (For ARF Only)

- (1) Aircraft Mode: Fixed-wing airplane mode. Do not use helicopter mode.
- (2) Rudder: 0% to 100% With No Mixing
- (3) Curve: Channel 1, 2, 3 & 4 all set to zero

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- (4) Gyro: Fine tune to maximize stability
- (5) Move both the throttle stick and throttle trim by looking at the LCD screen to the lowest position- Very important, otherwise motors will not start
- (6) Aircraft Mode: Fixed-wing
- (7) Rudder: 0% to 100% With No Mixing
- (8) Use transmitter rudder trim to adjust heading (yaw)
- (9) All channels are set to NORMAL for Walkera and Spektrum radios (Except Gear Channel & AUX 1)
- (10) For added stability on the CINEWING 6, you may choose to set the dual rate to 55%

Please double check all settings, tie the CINEWING 6 down to a bench, and test fly it to check the settings. Some transmitters use random bind, which means you have to plug in the battery to the CINEWING 6 within 2-3 seconds after the radio is turned on. Please observe the LED light located at the back of the CINEWING 6 GPS Module (Please refer to 5.3 LED light description). Fixed ID Bind is the TURBO ACE default binding setting for the CINEWING 6 RTF unit (Please refer to the FIXED ID BIND section). Most receivers flash before binding and remain solid after binding, so please make sure your receiver has properly been bound to your transmitter. Do not launch the CINEWING 6 on its maiden flight until all operations are confirmed as normal, especially after shipping. Tie it down to a bench for a preflight check. Failure to do so may cause serious damage to the CINEWING 6 and/or people around it. Factories and dealers will not be liable for any damages from the operation of this aircraft.

4.6 Transmitter Flight Control & Gain Adjustments (For ARF Only)

We do not recommend that any inexperienced users adjust the flight control or Gain values using the DJI NAZA Assistant software. It is a steep learning curve for these adjustments, which we have already fine-tuned and completed for you. Improper settings may cause the CINEWING 6 to lose control and may result in serious damage. If the original factory settings are altered in any way, with the exception of transmitter calibration adjustments for ARF packages, it will automatically void the 24-hour “No Dead on Arrival” guarantee. Dead on arrival returns are strictly checked for setting changes and tampering. Although knowledge can be acquired over time, the CINEWING 6 flight controller adjustments are sophisticated and complicated. Do

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not attempt to change these settings until you are familiar with the setup. Please go to online forums to learn about the flight control settings, as we do not provide any technical support for these settings.

When you have purchased the Ready-to-Fly unit, there are 3 control modes that we have setup on your flight controller and transmitter: GPS and ATTITUDE and MANUAL. GPS Mode has the best auto stabilization and ability to perform GPS Lock, making the aircraft very easy to fly. This mode is appropriate for videographic and photographic applications. Attitude Mode has some auto stabilization and ability to perform attitude hold and makes the aircraft easier to fly, which is also suitable for videographic and photographic applications. Manual Mode is suited for experienced pilots, as it allows more manual control in adverse. Do not switch to the MANUAL mode if you are a beginner.

CINEWING 6 with GPS: The three modes can be switched during flight by toggling the Flap switch on top of your radio. For the Ready-to-Fly CINEWING 6, we have set this switch on your radio to GPS MODE when toggled forward, ATTITUDE MODE when toggled to the middle, and MANUAL MODE when toggled backward. Before takeoff, please make sure all front panel switches on your transmitter are flipped forward and all switches such as the flight mode/hold switches on the side panel are pushed down.

The basic gain and attitude gain values of the CINEWING 6 can be adjusted in the AUTOPILOT section when you run the DJI NAZA ASSISTANT SOFTWARE. The default settings are BASIC GAIN Pitch set to 130%, Roll set to 120%, Yaw set to 90% and Vertical set to 120% and ATTITUDE GAIN Pitch set to 100% and Roll set to 100% (**Warning:** BASIC GAIN should never be set lower than 90%). Again, it is very important to remember to tie down the aircraft and remove all the propellers when you are programming the flight controller with the supplied Programming USB-MicroUSB cable. Failure to do so may cause accidental motor start up with incorrect values entered and may result in serious injury. Always remember to tie down the CINEWING 6 to a bench for test flights after you have changed any settings (If the motor does not spin while performing the CSC, please re-calibrate/perform the Command Sticks Calibration).

4.7 GPS Calibration

GPS Calibration is required, if

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- New WooKong-M or Naza is re-installed
- GPS Module is repositioned
- Any electronic devices are added/removed/repositioned (main controller, servo, batteries, etc)
- CINEWING 6 does NOT fly straight
(Please refer to WooKong-M/Naza User Manual section “Digital Compass Calibration” for more details)

GPS Calibration procedure:

(1) (TURBO ACE default settings assign the control mode switch to mix switch on Devo 10). Flip the control mode switch back and forth from “Manual mode” to “GPS mode” 10 times, and the LED indicator (located behind the GPS) will turn a constant blue- this indicates that you have entered calibration mode. Before continuing, make sure the switch’s starting position is in Manual Mode, and the ending position is in GPS mode [***Manual mode is when the switch is flipped backward (toward pilot), and GPS mode is when the switch is flipped forward (away from pilot)].

(2) Calibration in horizontal: Rotate the copter with the horizontal surface until the LED turns a constant green, indicating completion of horizontal calibration.

(3) Calibration in vertical: while the LED is a constant green, hold your copter vertically with the nose pointing down to the ground and rotate it along with the vertical axis, until the green LED turns off, which indicates completion of vertical calibration.

(4) After completion of the horizontal and vertical calibration, the LED will show whether the calibration has been successful or not.

- If LED turns white for 3 seconds, calibration was successful, and it will exit calibration mode automatically.
- If LED blinks red, the calibration failed. Please start the GPS calibration again, starting from Step (1).

4.8 CINEWING 6 Wiring Connection Chart for Spektrum DX 8 &

AR8000

| CINEWING 6 with GPS module | DX 8 & AR8000 | | | INDICATES ONLY ONE CAN BE ACTIVATED |
|----------------------------|---------------|-------------------|--------------|-------------------------------------|
| AR8000 | NAZA FC | TX Setting Output | Gimbal Servo | CINEWING 6 |
| ELEV | E | | | |

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| | | | | |
|------|----|---------------|--|-------------------------------|
| AILE | A | | | |
| THRO | T | | | |
| RUDD | R | | | |
| AUX1 | U | AUX 1→Flap SW | | GPS - ATTITUDE MODE - MANUAL |
| AUX3 | | AUX3 | | TILT CONTROL FOR GIMBAL |
| Gear | X2 | Gear→F. Mod | | OFF - COURSE LOCK - HOME LOCK |
| BATT | | | | TELEMETRY (OPTIONAL) |

4.8 CINEWING 6 Wiring Connection Chart for Futaba 14SG & R7008SB

| CINEWING 6 with GPS module | 14SG & R7008SB | | | INDICATES ONLY ONE CAN BE ACTIVATED |
|----------------------------|----------------|-------------------|--------------|-------------------------------------|
| R7008SB | NAZA FC | TX Setting Output | Gimbal Servo | CINEWING 6 |
| 1 | A | | | |
| 2 | E | | | |
| 3 | T | | | |
| 4 | R | | | |
| 5 | U | SB | | GPS - ATTITUDE MODE - MANUAL |
| 6 | X2 | SE | | OFF - COURSE LOCK - HOME LOCK |
| 7 | | RD | | TILT CONTROL FOR GIMBAL |
| BATT | | | | TELEMETRY (OPTIONAL) |

4.9 Control Mode Comparison

| | GPS Mode | Atti. Mode | Manual Mode |
|-----------------------|--|---------------------------|---|
| Command Stick Meaning | Multi attitude control; Stick center position for 0° attitude, its endpoint is 35° | | Max angular velocity is 150°/s. No attitude angle limitation and vertical velocity locking |
| Command Linearity | Yes | | |
| Stick Released | Position Lock when GPS signal is | Only attitude stabilizing | NOT recommended to release stick in any situation |

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| | | | |
|---------------|--|---|--|
| | sufficient | | |
| Altitude Lock | Maintaining altitude lock is best above 1m from ground | | NO altitude lock |
| GPS Lost | After 10s when GPS signal lost, system engage Attitude Mode | Only attitude stabilizing without position lock | |
| Safety | Attitude & speed mixture control ensures stability | | NOT recommended to be used in any situation |

TESTING & OPERATIONS

5.1 Tie-Down Flight Test

- (1) Tie down all six arms (not the skids) of the CINEWING 6 to a heavy fixture such as a table or a work bench. Make sure there is plenty of space around the aircraft. If you have a random binding transmitter such as the Devention 10, please make sure there are no other similar radios nearby during the process of binding.
- (2) Prior to initiating your CINEWING 6, make sure it is on a water level surface and do not move the CINEWING 6 before takeoff or during the binding process. Failure to do so will result in miscalculations of the 3-Axis gyro compensation, and the CINEWING 6 will not be able to operate properly.

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- (3) Make sure your battery is fully charged using a battery meter (should read about 4.1V to 4.2V per cell on all 6 cells). Plug in the battery connector to the power input connector from the chassis. Do not run any LiPo batteries below 3.67V per cell without load, otherwise the battery will be permanently damaged.
- (4) After 2 seconds of initialization, the CINEWING 6 will issue 5 consecutive beep tones.
- (5) Place your transmitter flat on a table in front of you with the joystick facing up. Make sure all switches above the two control sticks on the transmitter are pushed forward and away from you and the two switches at the very top of the transmitter side panel are pushed down towards the table. Move the throttle stick (left stick) to the lowest position towards you. At this time, you do not need to move the directional stick (right stick), which is spring loaded and will always return to the middle position when released). Now you can turn your transmitter "ON."
- (6) Wait another six seconds for 5 consecutive beep tones from the CINEWING 6, which indicate that binding between the receiver and the transmitter is complete. Before moving any controls on the transmitter, it's always good practice to look for the solid red LED light on the receiver to confirm that binding is complete.
- (7) Stay at a safe distance and execute the combination stick command (CSC) to start the motor.



- (8) Make sure that the propellers of Motors #1, #3, #5 are rotating in a CCW (counter clockwise) direction and the propellers of Motors #2, #4, #6 are rotating in a CW (clockwise) direction. As you increase throttle, the propellers should speed up and vice versa.
- (9) Moving the rudder stick (which also controls the throttle) to the right should decelerate CCW propellers (Motors #1, #3, #5), thereby decreasing CCW torque so the aircraft turns CW. Moving the rudder to the left should decelerate CW propellers (Motors #2, #4, #6), thereby decreasing CW torque so the aircraft turns CCW.
- (10) Moving the directional stick to the top should decelerate the three front propellers (Motors #1, #2, #3) and moving the directional stick to the bottom should decelerate the back propellers (Motors #4, #5, #6). Moving the directional stick to the left should decelerate the left propellers (Motors #1, #4, #5) and moving

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the directional stick to the right should decelerate the right propellers (Motors #5, #6).

- (11) Move the throttle stick to the lowest position and the propeller should come to a stop. Unplug the battery plug before turning the transmitter off.
- (12) Repeat above Steps (2) to (11) twice more so that you complete 3 rounds of 8 to 10 minute tie-down flights.

5.2 Actual Flight Test & Training

- (1) Pick a calm day or find a large empty indoor space. Keep all people and pets away from the flight test area and place the CINEWING 6 on a level surface.
- (2) Repeat Steps (2) through (11) under Section 5.1
- (3) If you fly the CINEWING 6 too close to the ground, the wash (deflected air) coming back up from the ground may cause significant flight instability. As with all propeller driven systems, you should try to keep larger aircraft at least 3 to 4 feet from the ground and avoid flying in a small room, which deflects air current. Before takeoff, you may also notice some vibration of the aircraft caused by auto stabilization from the deflected air. Once the aircraft lifts away from the ground, it will stabilize.
- (4) If you are a beginner pilot, we highly recommend that you purchase a simulator training package or a training quad such as the Walkera Ladybird or Walkera QR X350. Even though the CINEWING 6 is equipped with easy-to-fly auto stabilization, it is unsafe to operate the aircraft without any flight experience. Always try to maintain the tail-in position (tail towards you) because that is the easiest orientation to keep your aircraft in control.
- (5) As your skills improve, additional training includes flying in circles, figure “8”s, backwards, sideways and other exercises to improve coordination.

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battery. Do not force your CINEWING 6 to run continuously when it's low. Doing so will only permanently damage your battery and/or drastically reduce the flight time.

- (3) Disconnect the battery plug from the CINEWING 6 when you are done flying. Do not leave your battery plugged into the CINEWING 6 after a flight, or it will surely be damaged.
- (4) An inexpensive battery meter with an alarm would be a smart tool to have. Always check each battery's charge before each flight. A fully charged battery should be around 4.1V to 4.2V per cell.
- (5) For your transmitter, a transmitter battery is a lot more reliable and convenient than 8 "AA" batteries. With a larger capacity, a longer lifespan, and the desired voltage, the transmitter battery is also rechargeable (uses the same battery charger as the helicopter battery).

CAMERA MOUNT SETUP

6.1 CINEWING 6 CAMERA MOUNT SERVO CONTROL SETUP

IMPORTANT: Only digital servos are compatible with the WooKong/Naza flight controller. Using an analog servo will cause malfunctioning, produce loud buzzing noises and burn up the servo. A light buzzing sound from a digital servo is, however, normal. The CINEWING 6 features built-in gyros for camera mount auto compensation so there is no need to purchase separate gyros for your camera mount.

6.2.1 How to set your camera TILT (PITCH) auto compensation control for the CINEWING 6 flight controller, receiver and transmitter

Connect flight controller F2 to tilt (pitch) servo.

Connect receiver's (For Walkera Devo 10 is Aux 4, For Spektrum DX8 is Aux 3, or Futaba 14SG is channel 7) Channel (assuming the AUX4 channel has not been already used for flight mode control or other functions) to flight controller's X1 using a 3 wire cable with the black ground wire closest to the edge of the flight controller (some receivers' polarity for ground may be different, so see your receiver manual for more details). Go to the AUTOPILOT tab in DJI NAZA Assistant Software to set all remote adjustments to INH, and go to the GIMBAL tab and click ON to enable the gimbal manual control. Additionally, when you tilt the CINEWING 6 forwards or backwards, the CINEWING 6 gyro will sense the tilt so the camera mount servo will also automatically compensate for that by pitching the camera in the opposite direction to compensate. Go to the GIMBAL tab in DJI NAZA Assistant Software, and go to the 3. With Automatic Control Gain, you can increase the gain to make camera mount auto compensation movement faster or decrease the gain to make auto compensation movement slower. Moreover, if the camera mount is moving in the wrong direction, you can click the button under DIRECTION, to change between "NORM" and "REV."

For Walkera Devotion 10, the AUX 4 knob can be turned to adjust the camera mount's tilt action.

6.2.2 How to set your camera auto compensation ROLL control for the CINEWING 6 flight controller, receiver and transmitter

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Connect flight controller F1 to roll servo. Now the servo will automatically compensate when the CINEWING 6 rolls. First, tie down your CINEWING 6 before you turn on your transmitter radio, then connect the battery to the CINEWING 6. Connect the provided Programming USB cable from your PC computer's USB port (XP or WIN7) to Micro USB port on the CINEWING 6 communication port (on the LED side panel of the CINEWING 6). Please connect this cable after the transmitter has been bound to the receiver. Go to the GIMBAL tab to click ON to enable the gimbal manual control. Additionally, when you roll the CINEWING 6 left or right, the CINEWING 6 gyro will sense the roll so the camera mount servo will also automatically compensate for that by rolling the camera mount in the opposite direction to compensate. Go to the GIMBAL tab in DJI NAZA Assistant Software, and go to the 3. With Automatic Control Gain, you can increase the gain to make camera mount auto compensation movement faster or decrease the gain to make auto compensation movement slower. Moreover, if the camera mount is moving in the wrong direction, you can click the button under DIRECTION, to change between "NORM" and "REV."

6.2.3 How to adjust the compensation gain and servo direction reversal in the DJI NAZA Assistant Software

Remove all 6 propellers for safety- please DO NOT skip this or serious accidents may occur. Turn on your radio and connect the battery (plugging in the main battery to the CINEWING 6 is required to provide power to the gimbal servos) to the CINEWING 6. Make sure your transmitter throttle stick is all the way down before binding. For safety, please be very cautious to avoid moving the throttle stick of your transmitter during the entire process. Connect the USB cable from your PC to the micro USB port of the CINEWING 6 communication port (on the LED side panel of the CINEWING 6). Double click on the application DJI NAZA Assistant Software. At first launch of the application, the language may appear in Chinese- click on this Chinese tab anyway and change the language to English by clicking on the tab on the top of the screen. Sometimes when you launch an application and you don't see anything, it may be because the screen is hidden behind the previous application such as Windows Explorer, which you may have launched previously. Click on the "Gimbal" tab on the left panel of the screen. Now test the gimbal on the CINEWING 6 by tilting it firmly on your hands. When the CINEWING 6 tilts upwards, the gimbal should travel and compensate in the opposite direction by tilting down. The camera should continue to lock on the subject you are shooting. If, however, the gimbal compensates in the same

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direction, go to 3. Automatic Control Gain under direction and click the box "NORM" or "REV" on the screen to reverse the servo travel. Test the gimbal compensation for roll action, and if compensation is in the same direction, simply click the box below direction for roll "NORM" or "REV." Now test the gimbal for the amount of compensation.

NOTE: The factory default compensation for tilt is set at 0.00. Each gimbal servo travels differently, so adjustments may be required. If the gimbal compensation is too much or too little, you may adjust both the gimbal tilt and gimbal roll value by entering the number on the gain. When you have completed the settings, click on "Write" at the top of the program. You must click on "Write," otherwise the data might not be loaded onto the CINEWING 6 controller.

6.2 Flight Control Adjustment for Auto-Stabilization

Over attitude gain control may affect the vibration on the CINEWING 6. This type of vibration is particularly noticeable during climb out when there is a violent shake during acceleration. Also, any drastic weight change, such as loading on a DSLR camera, may require the attitude control gain adjustment. To access the adjustment, open the DJI NAZA Assistant Software, which is contained in the included flash drive. Connect the CINEWING 6 to a Windows-based PC with Windows 8, Windows 7 or XP (For Windows to run this application, a current DirectX driver may be required). Upon initial application launch, you may see unreadable Chinese language. Just click on the top tab, and change language to English. Select the "AUTOPILOT" tab on the left column of the screen. Adjust the Basic Gain and Attitude Control Gain for Pitch, Roll, Yaw and Vertical by increments of 10. It is important that you click the "WRITE" tab, otherwise the new settings will not be stored in the flight controller.

6.3 Basic Gain and Attitude Gain Adjustment for Stabilization

For BASIC GAIN, recommended settings are Pitch set to 130%, Roll set to 120%, Yaw set to 90% and Vertical set to 120%. For ATTITUDE GAIN, Pitch set to 100% and Roll set to 100%. **Warning:** BASIC GAIN needs to be set at a minimum of 90%. If your CINEWING 6 is not as stable after a heavy camera or camera mount is installed, you should increase the BASIC GAIN and ATTITUDE GAIN by 15%-25% each time and re-test the performance of your CINEWING 6. Please refer to 4.6.3 to adjust your BASIC GAIN and ATTITUDE GAIN.

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Assumptions on DJI NAZA FC design:

Assume aircraft flies stable as a general rule, which means FC outputs control signal to motor when it finds frame tilts for a stabilization recovery. We consider this non-RC tilt as an error.

According to the previous flight states, on the condition that vibration occurs during tilt, this can still be regarded as the stable state.

When the aircraft tilts to a certain direction, it will engender a tendency, which could be reinforced.

Notice: Assumption 2 is not contradictory to Assumption 3.

We haven't built CINEWING 6 mathematical modeling, which needs adjustments in Gain Tuning through personal sense. It is suggested that users grab the aircraft on the ground when tuning, which takes patience and skill. You will only get a comparatively ideal value after hours of tuning. **When setting Basic Gain and Attitude Gain Parameters, please exercise caution and always have the CINEWING 6 tied down to a bench.**

MAINTENANCE & REPAIR

7.1 Replacing Motors (For Repairs Only)

To simplify motor replacement, the CINEWING 6 motors can be disconnected at the end of the arms. Replacing a motor should be relatively easy in comparison to other hexacopters.

IMPORTANT: Remember to reapply Loctite when putting bolts and screws back.

- (1) Make sure all propellers are removed while repairing or adjusting settings for the CINEWING 6.
- (2) Make sure your battery is disconnected from the CINEWING 6.
- (3) Identify the motor that needs to be replaced and put a marking sticker on the corresponding extension arm so you can identify which motor you are working on.
- (4) Remove the 4 bolts that secure the motor mount.
- (5) Loosen the center bolts between the motor mount and extension arm so the wire can move freely and easily.
- (6) Verify the following: For CCW Motor#1 & Motor#3 & Motor#5. For CW Motor#2 & Motor#4 & Motor#6. Then, disconnect the three wire connectors for the old motor and remove the old motor. All brushless motor wires have 3 wires.
- (7) Reconnect the new motor's three motor wires with the three ESC wires coming out of the extension arms.
- (8) Remount the new motor on the end of the extension arm using the four bolts with Loctite.
- (9) Please verify that the three motor wires are installed in the right positions by performing a tie-down flight test (refer to Section 5.1) and paying special attention to the motor that was replaced (look for the marking sticker on the extension aluminum arm). If you can't tell which direction the motor is spinning, you might want to use a piece of paper to touch the motor to determine the spinning direction of the motor.
- (10) If the motor direction is correct, go to the next step. If the motor direction is incorrect, you can change any two wires' connection to reverse the direction of

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the motor. Check your connections and make necessary corrections. Now tidy up the wires by pushing them back into the extension arm.

- (11) Tighten the center bolt between the motor mount and extension arm. Sometimes the wires inside may get in the way, so please make sure the bolts don't damage the wire insulation. Pulling the 2 wires to the left and 1 wire to the right usually does the trick. If not, you can tug or wiggle the wires to free the wires from the bolts. If you force the bolts into the wires you may short out the ESC or Flight Controller.
- (12) If you make any changes, always repeat the tie-down flight tests in Section 5.1 until you are satisfied that everything is operating properly.

7.2 Replacing ESC (For Repairs Only)

When replacing the CINEWING 6 ESCs, you must follow a specific procedure, otherwise you may risk damage to the ESC wires, which may in turn short circuit the ESC and Flight Controller. **Please remember to reapply Loctite when putting bolts and screws back.**

- (1) Make sure your battery is disconnected from the CINEWING 6.
- (2) Verify the following: For CCW Motor#1 & Motor#3 & Motor#5. For CW Motor#2 & Motor#4 & Motor#6. Then, disconnect the 3 connectors between the motor wires and ESC wires.
- (3) Release the motor mount from the end of the extension arm by removing 4 bolts.
- (4) Remove all the bolts from the extension arm.
- (5) Identify the ESC that you are replacing and trace the ESC's input data wires back to the Flight Controller's output port. Disconnect the ESC's black header connector from the Flight Controller. Then, trace the ESC's power supply wires back to the battery connector and disconnect the ESC's bullet connector from the 1-to-6 Power Adapter. Carefully remove the ESC and its associated wires from the extension arm. Mark the old ESC for future reference.
- (6) Use the new ESC to replace the position of the old ESC.
- (7) Thread the remaining ESC wires through the chassis. When connecting the black header plug on the Flight Controller's output port, make sure the brown ESC wire is closest to the edge of the Flight Controller unit. You may damage the Flight Controller and the ESC if the connector is plugged in wrong. Reconnect the bullet connector to the 1-to-6 power adapter.

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- (8) Reconnect the motor's three motor wires with the three ESC wires coming out of the extension arms.
- (9) Please verify that the three motor wires are installed in the right positions by doing a tie-down flight test (refer to Section 5.1) and pay special attention to the motor that was replaced (look for the marking sticker on the extension arm). If you can't tell which direction the motor is spinning, you might want to use a piece of paper to touch the motor to determine the spinning direction of the motor.
- (10) If the motor direction is correct, go to the next step. If the motor direction is incorrect, you can change any two black wires' connection to reverse the direction of the motor. Check your connections and make necessary corrections. Two wires connected incorrectly will cause the motor to spin in the wrong direction. Now tidy up the wires by pushing them back into the extension arm.
- (11) If you make any changes, always repeat the tie-down flight test (refer to Section 5.1), until you are satisfied that everything is operating properly.

7.3 Replacing Extension Arms (For Repairs Only)

When replacing the CINEWING 6 extension arm, you must follow a specific procedure, otherwise you may risk damage to the motor wires which may in turn short circuit the entire flight controller and the ESC assembly.

IMPORTANT: Remember to reapply Loctite when putting bolts and screws back.

- (1) Make sure your battery is disconnected from the CINEWING 6.
- (2) Put markers on the motor wires (1, 2 & 3) and the corresponding ESC wires (1, 2 & 3) that need to be replaced.
- (3) Disconnect the 3 connectors between the motor and ESC wires.
- (4) Release the motor from the motor mount by removing the 4 bolts underneath the motor.
- (5) Release the motor mount from the end of the extension arm by removing the bolts.
- (6) Remount the motor on the motor mount using the four bolts with Loctite.
- (7) Remember to use Loctite for all bolts. Follow these precautions and complete the next 2 steps.

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- (8) Verify that the three motor wires are installed in the right positions by doing a tie-down flight test listed in Section 5.1 and pay special attention to the motor that was replaced (look for the marking sticker on the extension arm). If you can't tell which direction the motor is spinning you might want to use a piece of paper to touch the motor to determine the spinning direction of the motor.
- (9) If the motor direction is correct, go to the next step. If the motor direction is incorrect, you can change any two wires' connection to reverse the direction of the motor. Check your connections and make necessary corrections. Two wires connected incorrectly will cause the motor to spin in the wrong direction. Now tidy up the wires by pushing them back into the extension arm.
- (10) If you make any changes, always repeat the tie-down flight test (refer to Section 5.1), until you are satisfied that everything is operating properly.

FIXED ID BIND

Setting up a Fixed ID bind between your CINEWING 6 & Devention Transmitter (Please skip this section if you have a Spektrum or Futaba radio)

IMPORTANT: When adjusting the settings of the CINEWING 6 (while it is turned on), make sure that the propellers are removed and that the unit is securely tied down before proceeding. These safety precautions will avoid any accidental motor startup.

Clearing your receiver's memory

Start by plugging in the Walkera bind plug (comes with receiver, if purchased) to the "Batt" port on the receiver, followed by plugging in the battery for the CINEWING 6. The red light on the receiver should blink rapidly. Wait for the CINEWING 6's connection tune to finish playing, then proceed by unplugging the bind plug (the red light should now blink at a slower pace), and unplugging the battery.

NOTE: The transmitter does not need to be on for this step.

Setting up the Fixed ID on your transmitter

First, go through the steps to bind the CINEWING 6 to your transmitter.

1. Turn on the transmitter.
2. Plug the battery into the CINEWING 6.
3. The CINEWING 6 is bound when the red light on the receiver turns solid.

From the home screen of the transmitter, go into the Main Menu screen and select: Model Menu → Fixed ID → turn Status to "On" → set the ID code to your desired value and hit enter. You will see a little menu saying "ID Match..." After the menu has disappeared, unplug the CINEWING 6 battery, unplug the transmitter, and you're done!

IMPORTANT: ALWAYS turn off the transmitter AFTER unplugging the CINEWING 6. Now your CINEWING 6 will only bind with the transmitter that you have set up the fixed ID bind with.

NOTE: If telemetry module is included in the package, make sure to connect the telemetry while you set up the FIXED ID, so the telemetry module will connect to that transmitter.

Aerial Intelligence UAS Pre-Flight Check List

Overall Check at beginning of flight day:

1. Radio Control - radio range check do before start of every flight day.
2. All batteries for flight are fully charged, no damage or frayed wires.
3. All screws and nuts and other hardware securely attached and tight
4. All components, RC Receiver, Flight Control Board, GPS module ESCs, FPV and telemetry, are mounted properly and secure.
5. All wires for fraying or areas showing rubbing damage from vibration, loose connectors or broken or cracked solder joints.
6. Overall does aircraft look straight and true, with no bent arms or out of alignment components.
7. Battery mounting area is secure and mounting Velcro straps are secure and not worn.
8. Landing gear is securely mounted and not bent out of alignment.
9. Check FPV system for range and mounting secure, batteries charged - All components functioning.
10. Check aerial photo/video (none FPV) is mounted securely and working properly. Check system cabling.

11. Pre-takeoff:

- Place aircraft in open spot where return home has 60 feet AGL to return under loss of radio
- Turn Remote ON—Red light should illuminate (or other color) Note: If remote light does not illuminate check batteries.
- Place camera to the ON position & START recording now to keep gimbal from resetting.
- Battery in copter – Listen for beeps - Flashing lights should be red and green
- Verify FPV picture, camera is recording and on, and camera moves up and down with controls
- Confirm all light are FLASHING GREEN—this may take a while
 - All GREEN—aircraft has homing position to return
 - Flashing RED and Green you can fly but no fully functioning GPS signal to return home
- Power ON —confirm startup and visually inspect the copter
- Takeoff slowly 5 ft control checks in all directions & angle camera set Note: Do not fly over 400ft or at any altitude you cannot safely land without damage to people or things.

Exhibit A: Aerial Intelligence HD, LLC Pre and Post- Flight Check List

Post-Flight Check Mechanical:

| | | |
|-----|-------|-------|
| MR: | Date: | Name: |
|-----|-------|-------|

| | | | |
|---|---|---|-----|
| Power: | N | Y | N/A |
| Wiring - visual inspection shows no cuts, burns, frayed coatings? | | | |

| | | | |
|---------------------------------------|---|---|-----|
| Battery to Distribution board: | Y | N | N/A |
| Plugs clean, solid, no play? | | | |
| Solder clean, bright? | | | |

| | | | |
|---|---|---|-----|
| Distribution to ESCs: Solder clean, no cracks or play? | Y | N | N/A |
| Motor 1 | | | |
| Motor 2 | | | |
| Motor 3 | | | |
| Motor 4 | | | |
| Motor 5 | | | |
| Motor 6 | | | |

| | | | |
|---|---|---|-----|
| Motors: Clean, Smooth hand rotation, Tight to shaft (no play), Clips in place, No burn marks on bullet connectors, Prop adapter screws secure, collet screws, Screws secure? | Y | N | N/A |
| Motor 1 | | | |
| Motor 2 | | | |
| Motor 3 | | | |
| Motor 4 | | | |
| Motor 5 | | | |
| Motor 6 | | | |

Exhibit A: Aerial Intelligence HD, LLC Pre and Post- Flight Check List

| ESCs: No burn marks or other marks on heat shrink or bullets? | Y | N | N/A |
|--|---|---|-----|
| ESC 1 | | | |
| ESC 2 | | | |
| ESC 3 | | | |
| ESC 4 | | | |
| ESC 5 | | | |
| ESC 6 | | | |

| Props: Intact, no chips or cracks? | Y | N | N/A |
|---|---|---|-----|
| Prop 1 | | | |
| Prop 2 | | | |
| Prop 3 | | | |
| Prop 4 | | | |
| Prop 5 | | | |
| Prop 6 | | | |

| Plates: Clean? No Flex, cracks, or fatigue? | Y | N | N/A |
|--|---|---|-----|
| Top | | | |
| Bottom | | | |

| Arms: Screws tight? No cracks, flex? Motor mounts secure? | Y | N | N/A |
|--|---|---|-----|
| Arm 1 | | | |
| Arm 2 | | | |
| Arm 3 | | | |
| Arm 4 | | | |
| Arm 5 | | | |
| Arm 6 | | | |

Exhibit A: Aerial Intelligence HD, LLC Pre and Post- Flight Check List

| Flight Controller: | Y | N | N/A |
|---|----------|----------|------------|
| Secured to chassis per manufacturers guidelines? | | | |
| Plugs and cables are secure? | | | |
| Mechanically Secured to prevent disconnect? | | | |
| GPS installed per manufacturers guidelines? Secure? | | | |
| R/C RX secured to chassis? | | | |
| R/C RX servo plugs shows no cuts, burns, frayed coatings? | | | |
| R/C RX antenna deployed per manufacturer guidelines? | | | |
| R/C RX to FC connections mapped correctly? | | | |

| VTX: | N | Y | N/A |
|--|----------|----------|------------|
| Mechanically Secured to chassis? | | | |
| Wiring secure? | | | |
| Antenna deployed as designed? | | | |
| FPV camera secure to chassis? Wiring checked? | | | |
| Gimbal secure to chassis, anti-vibration system in good condition? | | | |
| Camera mount to gimbal secure? | | | |
| Gimbal free from obstruction in all axis? | | | |
| Gimbal/Camera system wiring in place and secure? | | | |
| Landing gear secure? No cracks or signs of stress? | | | |
| Battery tray mounts secure? | | | |
| Battery straps free from debris? | | | |

Exhibit A: Aerial Intelligence HD, LLC Pre and Post- Flight Check List

| R/C Transmitter: | Y | N | N/A |
|--------------------------------|----------|----------|------------|
| Clean? | | | |
| Check battery for leaks? | | | |
| Switches free from dirt, dust? | | | |
| Antenna in working order? | | | |

| Ground station: | Y | N | N/A |
|---|----------|----------|------------|
| Wiring - visual inspection shows no cuts, burns, frayed coatings? | | | |
| LED Monitor - Clean, sun share in good order? | | | |
| Battery tray/mount in good order? | | | |
| VRX: | | | |
| Wiring inspected? | | | |
| Clean? | | | |
| Antenna deployed correctly? | | | |
| Tripod clean? | | | |
| Video splitter, wiring in good order? | | | |

| Firmware updates up-to-date. | Version: | Date of update: |
|-------------------------------------|-----------------|------------------------|
| All flight controller components? | | |
| Ground station components | | |
| R/C Radio | | |

| Ground UAV? | Y, N, N/A: | Reason: |
|---|-------------------|----------------|
| Any NO answers, GROUND UAV until fixed? | | |

Exhibit A: Aerial Intelligence HD, LLC Pre and Post- Flight Check List

| Batteries: | Y | N | N/A |
|---|---|---|-----|
| Change in form factor (puffing) since last inspection? | | | |
| In the last week, did any battery become over heated during use? | | | |
| Did you drop any battery? | | | |
| Any burns or charring on leads? | | | |
| Wiring - visual inspection shows no cuts, burns, frayed coatings? | | | |
| Battery cases visual inspection shows no cuts, burns, etc? | | | |
| Any changes noticed in performance? | | | |
| Notes: | | | |

| Charging station: | Y | N | N/A |
|---|---|---|-----|
| Clean? | | | |
| Free from debris and clutter? | | | |
| Wiring - visual inspection shows no cuts, burns, Etc? | | | |
| Power supply fan clean? | | | |
| Leads clean? | | | |